

E530

 **MANUAL SHAFT**
English



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INTRODUCTION

Damalini AB

Damalini AB develops, manufactures and markets Easy-Laser® measurement and alignment equipment based on laser technology.

We have more than 25 years of experience from measurement tasks in the field and product development. We also provide measurement service, which means that we ourselves use the equipment we develop, and continuously improve it. Because of this we dare to call ourselves measurement specialists.

Do not hesitate to contact us about your measurement problems. Our expertise will help you solve it in an easy way.

Declaration of conformity

Equipment: Easy-Laser® product range

Damalini AB declares that the Easy-Laser® product range is manufactured in conformity with national and international regulations.

The system complies with, and has been tested according to the following requirements:



EMC Directive	2004/108/EG
Low Voltage Directive	2006/95/EC
Laser Classification	Europe: SS-EN-608 25-1 :2007/SS-EN-60825-1:2007 USA: CFR 1040.10/11 - 1993
RoHs Directive	2002/95/EG
WEEE Directive	2002/96/EG

For Bluetooth® devices: This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference
- (2) this device must accept any interference received, including interference that may cause undesired operation.



Disposal of old electrical and electronic equipment (Applicable throughout the European Union and other European countries with separate collection programs)

This symbol, found on product or on its packing, indicates that this product should not be treated as household waste when disposed of.

It should be handed over to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed correctly, you will help to prevent potential negative consequences to the environment and human health. For more detailed information about the recycling of this product, please contact your local city office, household waste disposal service or the retail store where you purchased this product.

Quality certificate

Damalini AB is ISO 9001:2008 certified. Certificate number 900958.

Damalini AB confirm, that our products are produced according to applicable national and international regulations and standards. All components are checked before assembly and final products are tested in functionality and visually checked before delivery

The calibration of the equipment fully complies with ISO9001: 2008 #7.6

Limited warranty

This product is manufactured under Damalini's strict quality control system. Should the product fail within two (2) years from the date of purchase under normal usage conditions, Damalini will repair or replace the product free of charge.

1. Using new or refurbished replacement parts.
2. Exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product.

Proof of purchase date should be confirmed, and sent together with a copy of the original purchase document.

Warranty is valid under normal usage described in the user's manual appended with the product. The warranty comprises failure on Easy-Laser® product that could be related to material and/or fabrication errors. The warranty is valid only in the country of purchase.

The warranty is not valid in the following cases:

- If the product is broken due to mishandling or incorrect operation
- If the product has been exposed to extreme temperature, calamity, chock or high voltage.
- If the product has been modified, repaired or disassembled by unauthorized personnel.

Compensation for possible damage due to failure on Easy-Laser® product is not included in the warranty. Freight cost to Damalini is not included in the warranty.

Note!

Before delivery of the product for warranty repair, it is the responsibility of the buyer to backup all data. Data recovery is not included in the warranty service and Damalini is not responsible for data that may be lost or damaged during transit or repair.

Lithium Ion battery limited warranty

Lithium ion batteries inevitably lose power during their lifetimes, depending on usage temperatures and the number of charging cycles. Therefore, the internal rechargeable batteries used in the E-series are not included in our general 2-year warranty. There is a 1 year warranty for the battery capacity not to fall below 70 % (a normal change means that the battery must have more than 70 % capacity after more than 300 charging cycles). A 2 year warranty applies if the battery becomes unusable because of a manufacturing fault or factors that Damalini AB could be expected to have control of, or if the battery displays abnormal loss of capacity in relation to use.

Extended warranty

Easy-Laser® Measurement and Alignment Systems meet the highest quality standards! For this reason, we have extended the warranty to you to a total of 3 years — free of charge!

The prerequisite for a warranty extension is that you register your system parts on the Internet within 6 months of purchase. The warranty period begins on the date of purchase. The warranty extension applies to all products in accordance with the Easy-Laser® Warranty requirements.

Safety precautions

Easy-Laser® is a laser instrument in laser class II with an output power less than 1 mW, which requires the following safety precautions:

- Never stare directly into the laser beam
- Never aim the laser beam at anyone else's eyes.



Note!

Opening the laser units can result in hazardous radiation, and will invalidate the manufacturer warranty.

If starting the machine to be measured would result in injuries, the possibility to unintentionally start it must be disabled before mounting the equipment, for example by locking the switch in the off position or removing the fuses. These safety precautions should remain in place until the measurement equipment has been removed from the machine.

Note!

The system should not be used in explosive risk areas.

Service and calibration

Our Service centres will quickly assist you if your measurement system need to be repaired or when it is time for calibration.

Our main Service centre is located in Sweden. There are several local Service centres that are certified to carry out limited service and repair. Contact your local Service centre first before sending your equipment for service or repair. All Service centres are listed on our web site under Service and Calibration.

Before sending your measuring system to our main Service centre, please fill in the online Service and Repair report. www.easy-laser-service.com



Compatibility

The E-series is not compatible with previous analogue units from the D-series. You can however continue to use previous brackets.

Disclaimer

Damalini AB and our authorized dealers will take no responsibility for damage to machines and plant as a result of the use of Easy-Laser® measurement and alignment systems.

Copyright

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We might change and correct the manual in later issues without further information. Changes to the Easy-Laser® equipment may also affect the accuracy of the information.

September 28 2011



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DISPLAY UNIT

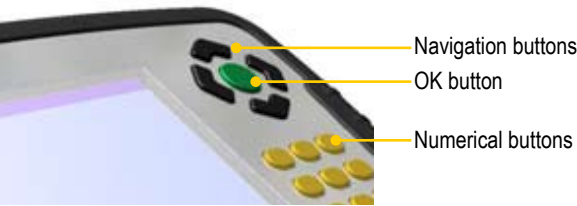


- A** Connection for external power.
- B** Network connection. (Not available on all systems.)
- C** External connection. Use for projector for example. (Not available on all systems.)
- D** USB A (master). Use for USB memory.
- E** USB B (slave). Use for connecting to a PC.
- F** Connection for Easy-Laser® equipment.
- G** Protective cover.



Navigation buttons

To navigate on the screen, use the navigation buttons. The selected icon is marked with a yellow frame. The navigation buttons are also used to move between the icons in a submenu and to change the values in the fields.



OK buttons






There are two green **OK** buttons and they both work in the same way. Press **OK** to select the currently selected icon for example.

Function buttons

The icons above the function buttons change depending on which view is currently displayed on screen.

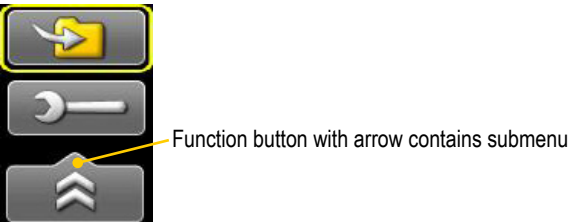


Below is a list of the most common icons.

	Back to previous view. Press and hold to leave current program.
	Back . There is no “previous view”. Leave the current program.
	More . Contains a submenu with general functions, such as  (Control panel) and  (Save file).

Submenus

The icons formed as an arrow contain a submenu. Use the navigation buttons to navigate in a submenu. Press **OK** to select.



Status bar

The Status bar contains additional information such as warning icon, current time and Bluetooth® connection.



There are also text messages regarding:

- The selected icon.
- Hints on what information you are expected to fill in.


Status bar icons

	Warning. Select the function button to get additional information regarding the warning.
	Warning. Displayed when the coordinates has been rotated in the detector. Go to Control panel to rotate coordinates.
	Display unit charging. Indicating that a power adaptor is plugged in.
	Hourglass. The Display unit is in the middle of a task.
	Peripheral. Indicates that a peripheral device is plugged in, such as a projector.
	Bluetooth®. Indicates that the Bluetooth® functionality is activated. The number beside indicates the number of Bluetooth® units connected.
	Printing report on thermal printer. The thermal printer is optional equipment.
	Printing performed OK.
	Printing problem.

Screen dump

It is possible to take screen dumps of what is currently displayed on screen. You can e-mail the screen dump or use it for reports.

Take a screen dump

1. Press and hold the numeric button period (.) for 5 seconds.
2. An hour glass is displayed on the status bar.
3. The screen dump is saved in the file system as a .jpg file. It is named with current date and time. Select  to open saved files. *See also Measurement file handling.*

LED signals

Right indicator


Yellow	Flashing: The internal battery in the Display unit is charging.
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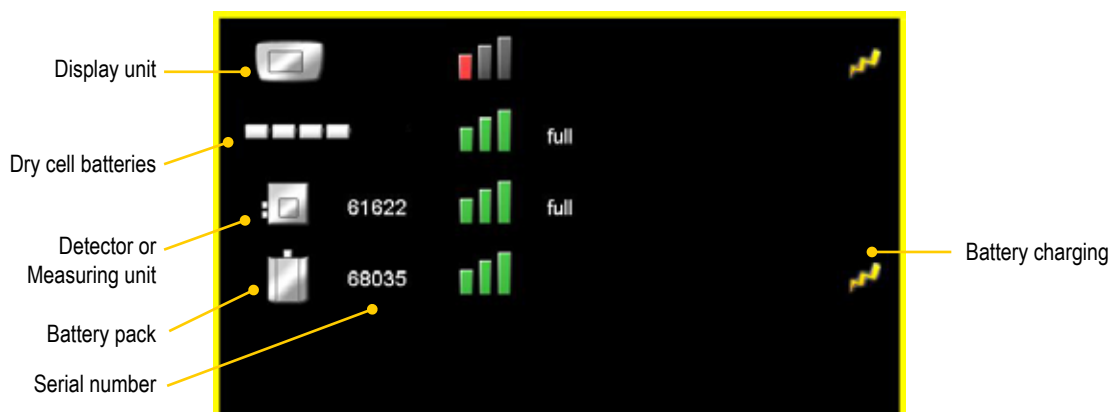
Left indicator

Left indicator has several functions and colours:

Red/Blue	Quick flashing: Reprogramming the system.
Red	Flashing: Warning, for example low battery.
Blue	Flashing: Searching for detectors equipped with Bluetooth®. Fixed light: Connected to detectors equipped with Bluetooth®.
Green	Flashing: Display unit is starting. Fixed light: The internal battery in the Display unit is fully charged.
Light blue	Flashing: Backlight is off, but the Display unit is still on. Press any button to activate the Display unit.

Battery

Select  to display the Battery view. This view gives you a good overview of the battery status of all connected equipment.



Note!

When finished working for the day, charge the whole system. Plug in the power adaptor to the Display unit and connect the measuring units by using cable.

Charge the Display unit

The Display unit can be used from -10°C to +50°C. Charge the Display unit within the temperature range of $\pm 0^\circ\text{C}$ to +40°C. You can charge the Display unit via:

Power adaptor

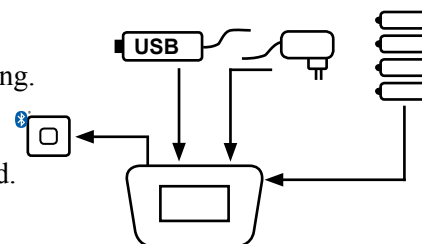
With the power adaptor plugged in, you can keep on working.

A PC via USB cable

While you have this connection, the Display unit is blocked.

Dry cell batteries (Not available on all systems)

When you get a battery warning, insert four R14 dry cell batteries in the battery compartment. This will prolong the power of the Display unit so that you can finish your measurement. However, if the internal battery is completely empty, the dry cell batteries are not strong enough to start up the Display unit.



Note!

If you shut the Display unit off while charging, it will charge faster.


Charge the Detector/Measuring units



The Detectors and Measuring units are charged by the Display unit when connected by cable. If you are using Bluetooth® units, switch to cable when the battery in the Detector/Measuring unit is low.

Charge the Bluetooth® units

The Bluetooth® units are powered by the Detector/Measuring units. To save energy, the Bluetooth® units will only connect when you are using a measurement program. There is no power switch on the unit. To switch off, simply unplug the unit. *See also chapter Bluetooth®.*

Calculator

The calculator is found on the Start view and Control panel ().

1. Select  and  to open the calculator.
2. Use the numerical buttons and function buttons to calculate.
3. Use the **OK** button as equal sign.





Select to display sub-menu



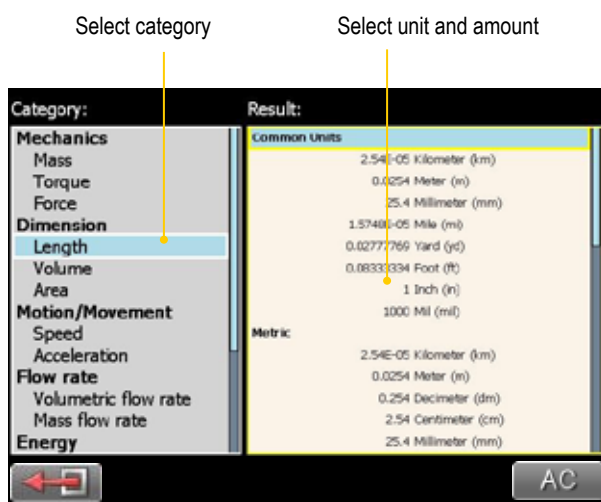
Use OK button as equal sign (=)

Unit converter

The unit converter is found on the Start view and Control panel ().



1. Select  and  to open Unit converter.
2. Select a category. Move using the navigation buttons up and down.
3. Press navigation button right. The result column is activated.
4. Select a unit to convert from.
5. Enter an amount. The other units are recalculated.

In the example below, one inch is selected.



Measurement file handling

Save file

1. Select  and  to save your measurement.
2. Enter a file name. The date and time will automatically be added to the file name. The measurements that you save will be available to other users as well.
3. Press **OK** to save the file.

Save file with barcode

The barcode scanner is not included in all systems. The first time you measure a machine, you paste a barcode on the machine and save the measurement together with the scanned barcode. Next time you check the same machine, all you need to do is scan the barcode and all machine data is read.

1. Scan the barcode on the machine.
2. Enter a file name.
3. Press **OK** to save the file. All measurement data is saved together with the barcode.



The barcode number is added to the file name. When you connect the Display unit to a PC the whole file name is shown:

Namn	Senast ändrad	Typ	Storlek
taper.2009-10-05 01:45-05.6.bob.XML	2009-10-05 13:45	XML-dokument	22 kB
standard.2009-10-13 03:58-05.6.bob.XML	2009-10-13 15:58	XML-dokument	17 kB
Small flange.2009-10-21 02:30-09.6.bob.XML	2009-10-21 14:30	XML-dokument	40 kB
pump 1.2010-03-17 11:58-05.5.bob.EAN9789170013386.XML	2010-03-17 11:58	XML-dokument	5 kB
pump 1.2010-03-17 11:57-17.5.bob.EAN9789170013386.XML	2010-03-17 11:57	XML-dokument	5 kB

File name Date and time User Barcode number



Report

A report is generated and saved in the filing system. You can not open an old measurement and save it again. You can however generate a new report from an opened file. This means you can for example change the language and make a new report from the opened measurement. You can download the report to a PC and print it.

Company logo

You can replace the logo on the report with your own .jpg file.

1. Name your logo `logo.jpg`. The default logo has the proportions of 230x51 pixels.
2. Connect the Display unit to your PC using the USB-cable.
3. Place your image in the Display unit's folder `Damalini/custom/reports/logo`.

File extensions (for example .jpg) are often hidden in the Explorer window. To display file extensions do the following: Open an Explorer window and press **Alt** to show menu. Select **Tools > Folder options**. Click the **View tab > Advanced settings > Clear the Hide extensions for known file types check box**.


Date format

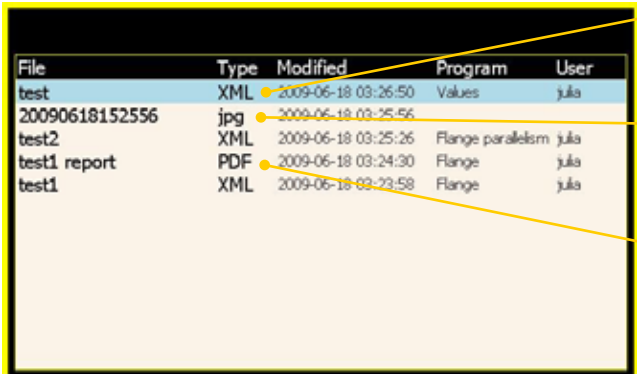
By default, the date and time format is set to Central European Time (CET).

You can change the date and time format used in your PDF reports.

See also Control panel > Date and time.

Open file

Select  (found on the start view and Control panel) to open saved measurements. The File manager is displayed. Here you can easily see who has saved the file, when and from which program it was saved. You see files saved by all users.




File	Type	Modified	Program	User
test	XML	2009-06-18 03:26:50	Values	jula
20090618152556	jpg	2009-06-18 03:25:56		
test2	XML	2009-06-18 03:25:26	Flange parallelism	jula
test1 report	PDF	2009-06-18 03:24:30	Flange	jula
test1	XML	2009-06-18 03:23:58	Flange	jula

xml
A measurement file. Select a file and press **OK** to open.

jpg
A screen dump.



PDF
A report. The PDF report can not be opened in the Display unit.

Open file with barcode

- Start the Display unit and scan the barcode. The **latest** measurement that was made and saved with this barcode is automatically opened.
- OR**
- Select  to open File view. Scan the barcode on the machine. **All** measurements saved with this barcode are shown.



Open file as template

You can open a saved measurement and use it to make a new measurement. This is very useful when you have many flanges or machines with the same dimensions for example. This way you do not have to enter the same distances every time.

- Select  (found on the Start view and Control panel). The File manager is displayed.
- Select a file in the list and select . The Edit distance view is displayed.
- Change distances if needed and proceed to measuring view.

Copy file to USB memory

You can easily copy a saved measurement or other files to a USB memory.



- Insert a USB memory.
- Select . The File manager view is displayed.
- Select the file you want and select .
- A folder is automatically created on the USB memory. The file is saved in the folder \Damalini\archive\.




Download file to PC

- Start the Display unit.
- Connect the USB cable between the Display unit and PC.
- While you have this connection, the Display unit is blocked.
- View and/or copy the files to the PC.

Print file (Optional)

The thermal printer is optional equipment.

1. Save the measurement. To print from a Shaft program, you need to open a saved measurement before you can print a report.
2. Connect the thermal printer and select  and .
3. The progress is displayed on the status bar.



	Printing report on thermal printer.
	Printing performed OK.
	Printing problem.

You can also save a measurement, download the pdf-report to your PC and print the pdf-report.



Report printed on thermal printer

Control panel

Select  and  to open the Control panel. Some of the settings are personal and will be default next time you start the system.



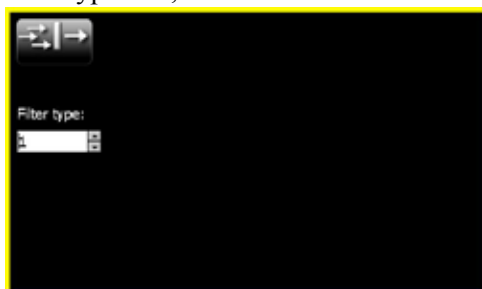
Filter

Select  to open the Filter view.

If the laser beam passes through air with varying temperature, this may influence the direction of the laser beam. If measurement values fluctuate, this could mean unstable readings. Try to reduce air movements between laser and detector by, for instance, moving heat sources, closing doors. If the readings remain unstable, increase the filter value (more samples will become available to the statistical filter).

Filter values


Use as short a time as possible that still produces acceptable stability during the measurement. Default is set to **1**. Normally you will use a filter value of 1-3. If you set the filter type to 0, no filter will be used.



Filter view

Unit and resolution

Personal setting


Select  to open the Units and resolution view. Use the navigation buttons to move between the fields. Set Metric or Imperial and which resolution you want to use. Default is set to 0.01 mm (0.4 mil). The selected unit is shown on the Status bar.

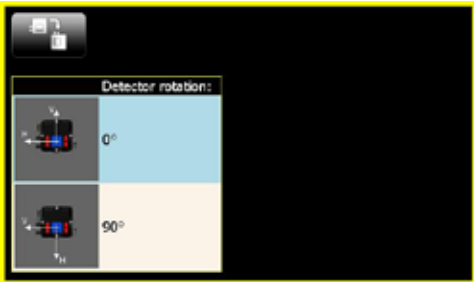


Unit and resolution view

Detector rotation

Personal setting


The coordinate system can be rotated 90°. Select  to open the Detector rotation view. When you have rotated the coordinates, a warning is displayed on the Status bar. Detector rotation will only affect detectors with two axis.

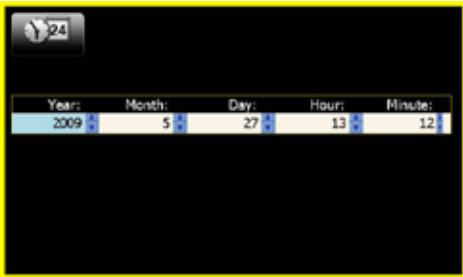


Warning displayed on Status bar

Detector rotation view

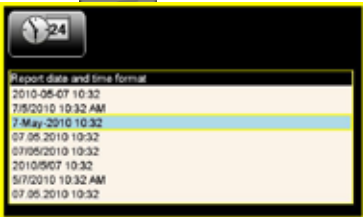
Date and time

Select  to open the Date and Time view. Set the date and time. Default is set to Central European Time. (CET)



Date and time view


Select  to set the date format used in your PDF reports.

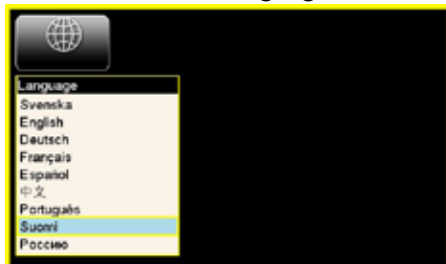


Date and time used in PDF reports

Language


Personal setting



Select  to open the Language view. Default is set to English. Use the navigation buttons to select a language. Press **OK** to save changes.

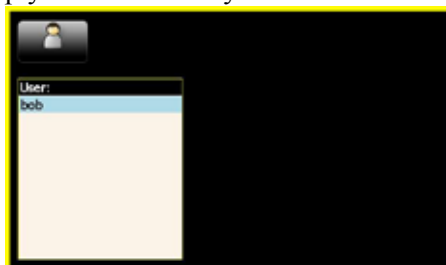


Language view

User

Select  to open the Users view. A user account is used for storing your personal settings.


Use the function buttons   to add or remove users. To switch user, simply select the user you would like to switch to and press **OK**.



User view

Backlight

Personal setting

Select  to open the Backlight view. Use the navigation buttons to move between the fields. Press **OK** to save changes. When backlight is off, the left LED signal will flash to indicate that the Display unit is still on.

Backlight level

Adjust the backlight to make it easier to read in bright sunlight. Remember however that a high contrast consume more battery. Default is set to 50%.

Reduce after

Set time before backlight reduction as a way to save energy. The Display unit will be dimmed, but is still on. Default is set to Never.

Off after


Set time before backlight off. Default is set to Never.

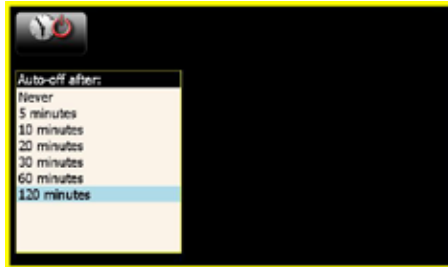


Backlight view

Automatic power off


Personal setting

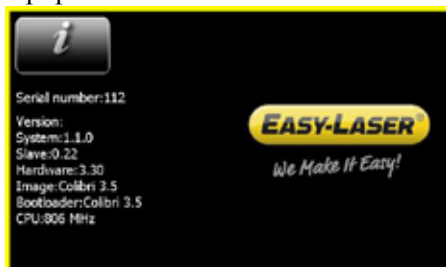
Select  to open the Automatic off view. Select how much time before automatic power off. Use the navigation buttons to select. Press **OK** to save changes.



Automatic power off view

Information

Select  to display the information regarding serial number and version of the equipment.




Information view

VGA

(Not available on all systems.)

Makes it possible to show display unit screen image with a projector, for example in a training context. Must be factory installed on order.

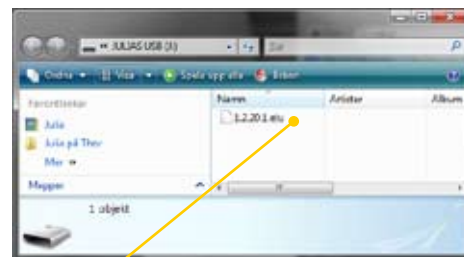
Select  to open the VGA view.



System update




Download update file

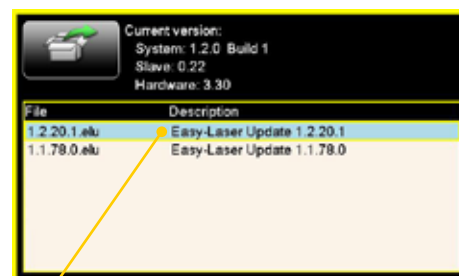
1. Go to www.damalini.com > Download > Software > E series Display unit Firmware Update.
2. Download the update file to your PC.
3. Unzip the file.
4. Copy the .elu file to the root of a USB memory.



Save .elu file on a USB memory.

Install update file

1. Start the Display unit. Make sure that the internal battery of the Display unit is charged. The battery symbol should be at least yellow.
2. Insert the USB memory in the Display unit. Do not remove the USB memory until the update is finished.
3. Select  and  to display the System update view.
4. Select the update file and press **OK**.
5. Select . The installation starts.
6. The Display unit will automatically restart when the installation is finished and the Main menu is displayed.



Select the .elu file.

Note!

During restart, the screen turns black for up to one minute. When the main menu is displayed, it can “freeze” (no response when you press buttons). If this happens, press the On/Off button for at least 15 seconds to restart the Display unit.



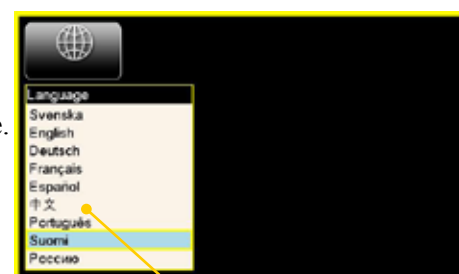
Main menu is automatically displayed after restart.

Font package

Some of the early E-series systems was not installed with Unicode fonts. To install the latest system updates, you need to install the font package with Unicode fonts.

Check if you need to install:

1. Select  and  to display the Language view.
2. Check if you have Chinese installed. **If Chinese is installed, you already have the correct Font package.** If not, please go to www.damalini.com > Download > Software > Eseries Display unit Font package update and follow the instructions above to install.



Chinese installed?



No need to update with Font package.

License


It is easy to upgrade your Display unit with additional programs or updates on the programs you already have.

1. Contact your Easy-Laser® distributor if you wish to upgrade your Display unit.
2. An e-mail will be sent to you with information on how to download the update file.
3. Save the file to the root of the file system to a USB memory stick or directly to the Display unit.

Save file on USB

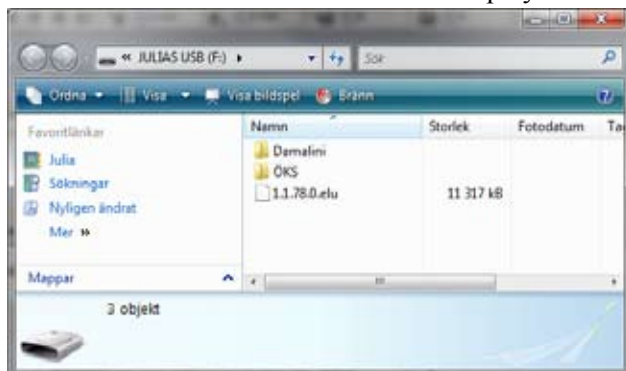
1. Save the downloaded license file to a USB memory stick.
2. Insert the USB memory stick in the Display unit.
3. Select  and  to display the License view.







4. Select  to search for licenses.
5. Press **OK** to import license.

Save file to Display unit

1. Connect the Display unit to a PC.
2. Save the license file to the root of the Display unit's storage.



3. Select  and  to display the License view.
4. Select  to search for the new license file. A window is displayed.
5. Disregard the text and select . The license file is installed and full functionality is achieved.

Bluetooth®

The Display unit is equipped with Bluetooth® wireless technology, which makes it possible for Display unit and Detector to exchange data without using cables.

Select  to display the Bluetooth view.

The ELM and ELS detectors does not have a built-in battery. You need to connect them to the Display unit via cable or use our chargeable battery pack. The Battery pack has Bluetooth® functionality.

Bluetooth®



Diode yellow when attached correctly.

Diode blue when Bluetooth® connection is established.



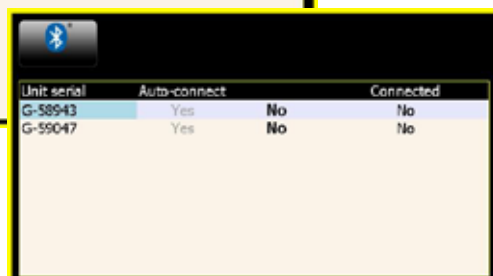
Set up

This is only necessary when adding new Bluetooth® units to the list.

1. Attach the Bluetooth unit to the detector.
2. Select  to open the Bluetooth® view.
3. Select  to search for Bluetooth® units.
4. The view is updated with the Easy-Laser® Bluetooth® units you can connect to.



Searching for Bluetooth® units



Found Bluetooth® units




Use navigation buttons to toggle between **Yes** and **No**.

5. Select the unit you want to connect to and set Auto-connect to **Yes**, using the navigation buttons. The unit will automatically be connected when you start a measurement program.
6. Press **OK** to save changes and to leave the Bluetooth® view.
7. Enter a measurement program. The Display unit will connect to the selected units. While connecting, the left LED indicator is blinking with a blue light which will turn to a fixed blue light once connected.
8. An icon on the status bar will indicate how many Bluetooth® units are connected.




One Bluetooth® unit connected

Function buttons

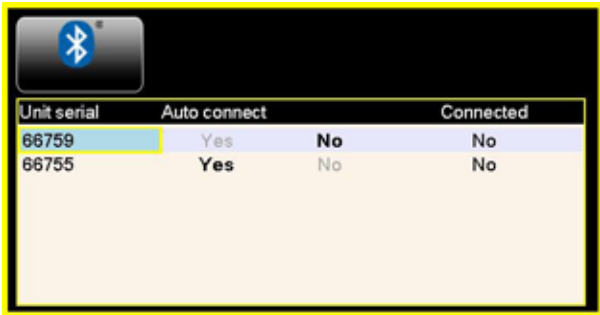
	Remove a Bluetooth® unit from the list.
	Search for Bluetooth® units.
	Cancel search. Use if your Bluetooth® unit is already found.

Use only one Bluetooth® unit

Many of our systems are delivered with two Measuring units. In some cases you might want to use only one unit together with a laser transmitter. By default both units are set to “Auto connect Yes”. If the unused unit is set to “Auto connect Yes”, the system will keep on trying to connect to it, even if it is not plugged in.

1. Attach the Bluetooth unit to the detector.
2. Select  to open the Bluetooth® view.
3. Set the Bluetooth® unit you want to use to “Auto connect **Yes**”.
4. Make sure that the other units are set to “Auto connect **No**”.
5. Enter a measuring program.

The Display unit will connect to the selected unit. This may take a couple of minutes.



Unit serial	Auto connect		Connected
66759	Yes	No	No
66755	Yes	No	No

Note!

Remove Bluetooth® unit from the Measuring unit before putting the equipment in the carrying case. If attached, it will discharge the Measuring unit.

Bluetooth® information

This device contains

FCC ID: PVH0925

IC: 5325A-0925

“This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions;

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.”

SHAFT PROGRAMS

This chapter describes functions that are general for all shaft programs.

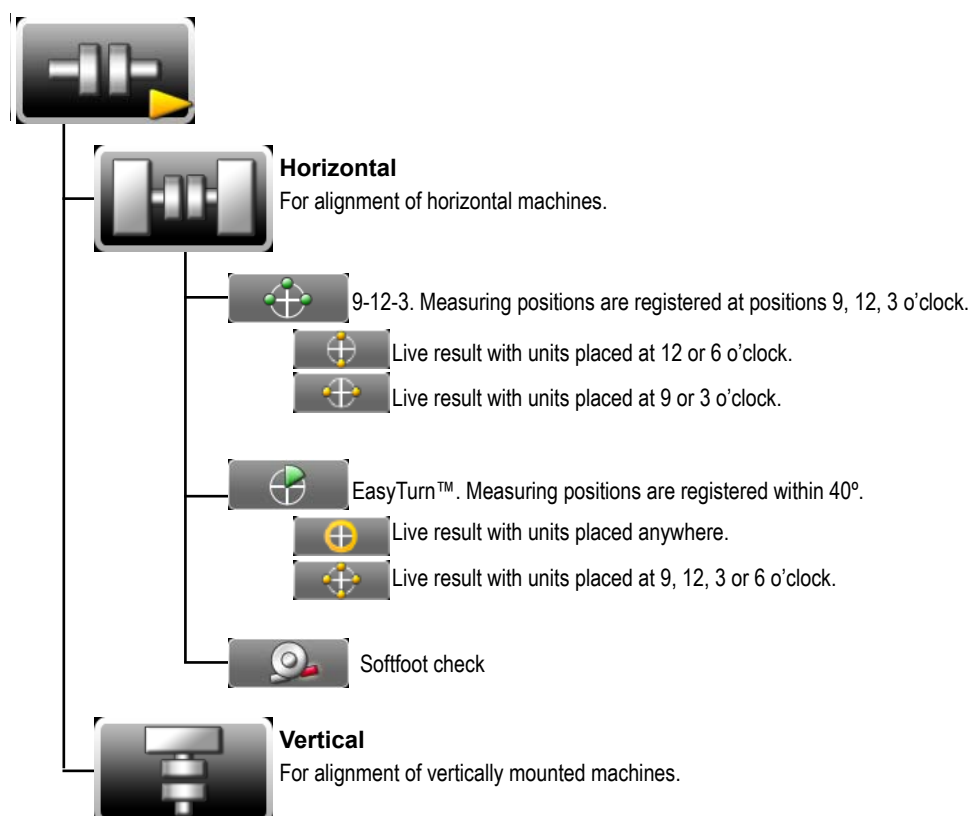
Preparations

Before starting a measurement, there are several things that are good to check to ensure a good and accurate measurement.

- Ensure a good measurement environment. Strong sunlight, warning lights, vibrations and temperature gradients can affect the readings.
- Make sure the surfaces are clean.
- Ensure that the foundation of the machine is stable.
- Check for play and clearance in the bearing.

Choose program

There are several shaft alignment programs. Choose the one suitable for your alignment needs.



PROGRAM VALUES



With the program Values, you can see live readings from the detectors.
As default, a target and a table is displayed.

Press **OK** to register values.

Live vertical values

Detector or Measuring unit

Serial number

Unit one (out of two connected)

Detector area (PSD)

Tolerance area

Laser line

Current range

Registered values



Use the navigation buttons to scroll the list

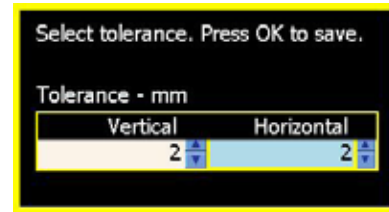
#	V	H
1	6.17	
2	5.41	
3	3.82	
4		

Function buttons

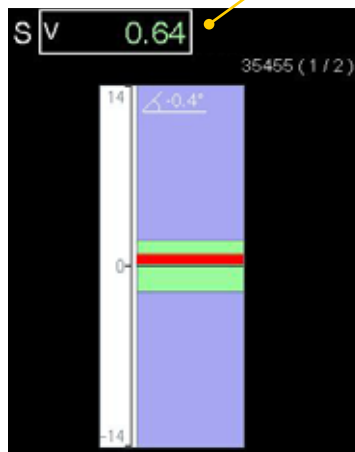
	Back. Leave program.
	More. Select to display a sub-menu, see icons below.
	Open Control panel. <i>See also Display unit > Control panel.</i>
	Set tolerance. <i>See next page.</i>
	Zoom. <i>See next page.</i>
	Save file. <i>See also Display unit > Measuring file handling.</i>
	<i>See also Automatic recording.</i>
	Delete registered values.
	Print report on thermal printer (optional equipment).
	<i>See also Streaming values.</i>
	Zero set. Set current value to zero.
	Half. Half displayed value.
	Absolute. Return to absolute value. Only available after zeroing or halving.
	Views. Choose how to display values. Use left and right navigation button to switch between two or more detectors when only one target is displayed.

Tolerance

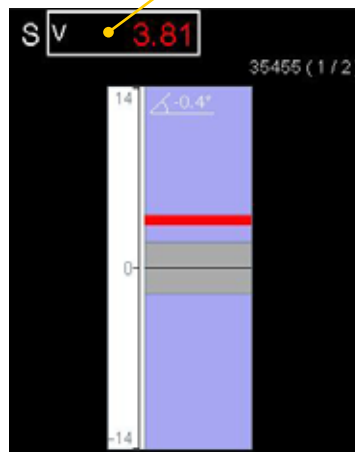
1. Select  and  to set tolerance.
It is possible to set different tolerance in vertical and horizontal direction.
2. Use navigation buttons to move between the fields and to change the tolerance.
3. Press **OK**.





Live values and marking displayed in green when within tolerance.

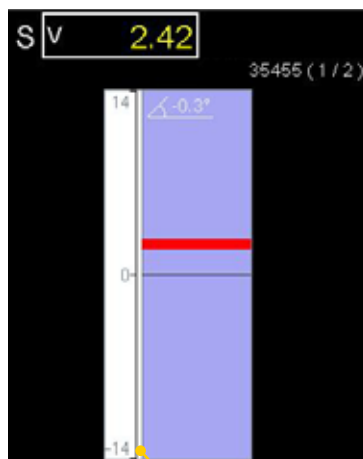
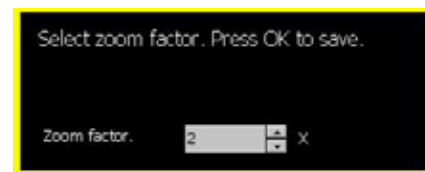


Live values displayed in red when outside tolerance.

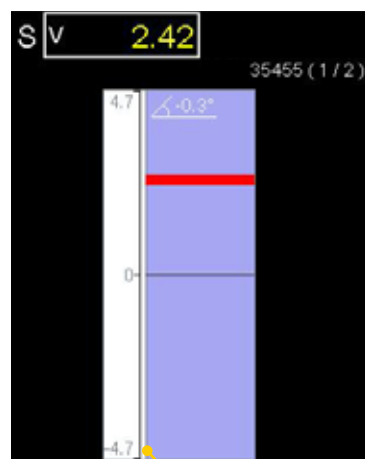


Zoom

1. Select  and  to zoom.
2. Select a zoom factor between 1–5. Use navigation buttons to increase or decrease zoom factor.
3. Press **OK**.



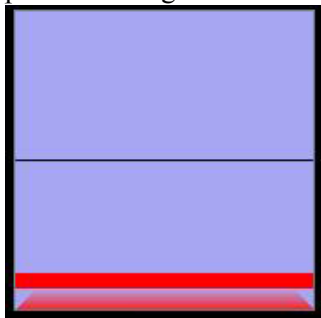
Default view



Zoom factor is set to 3

Edge warning

When the laser beam is close to the edge, the edge is “lit up” as a warning. It is not possible to register values when you see the edge warning.

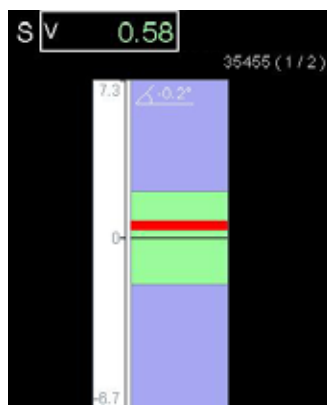


Half or Zero set value

Half value

Select $\frac{1}{2}$ to half displayed value.

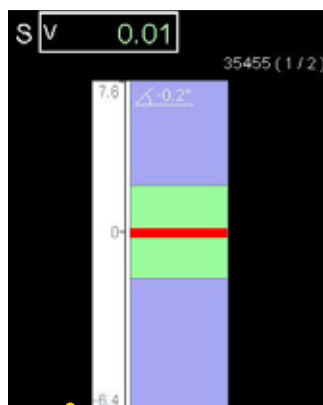
Zero line of the PSD moves halfway towards the laser line.



Zero set value

Select 0 to zero set displayed value.

Zero line of the PSD moves to the laser line.



Absolute value

Select $\frac{1}{4}$ to return to the absolute value.

Zero line of the PSD returns to the PSD centre.



Note the change of the current range

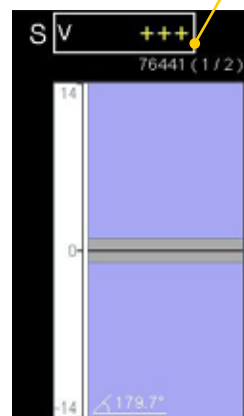
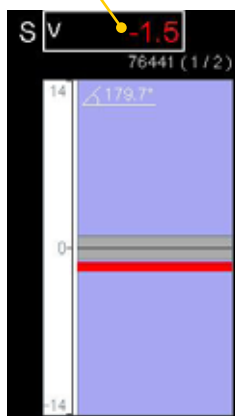
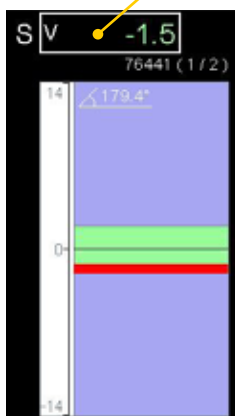
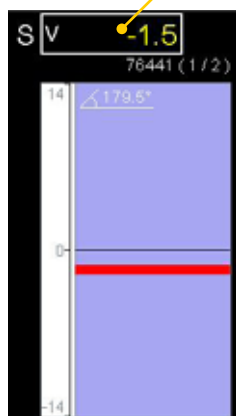
Live values – colours

Live values are normally yellow

Green when within tolerance



Red when outside tolerance

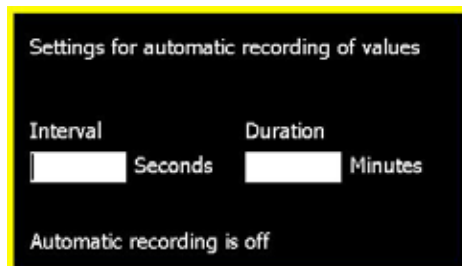
Loss of signal, laser beam interrupted for example



Automatic recording

In Values, it is possible to make automatic recording of values. This is very useful when you want to register values during a longer time period for example.

1. Select  and  to start automatic recording.
2. Set Interval.
3. Press navigation button “right”.
4. Set Duration.
5. Press **OK**. The recording will start and you can follow the progress on screen.



Icon indicates that values are being recorded



Views

You can decide how to display the current values. As default a target and a table is displayed, but you can choose to show only target for example.

Select  to display the different layout options, see image below.



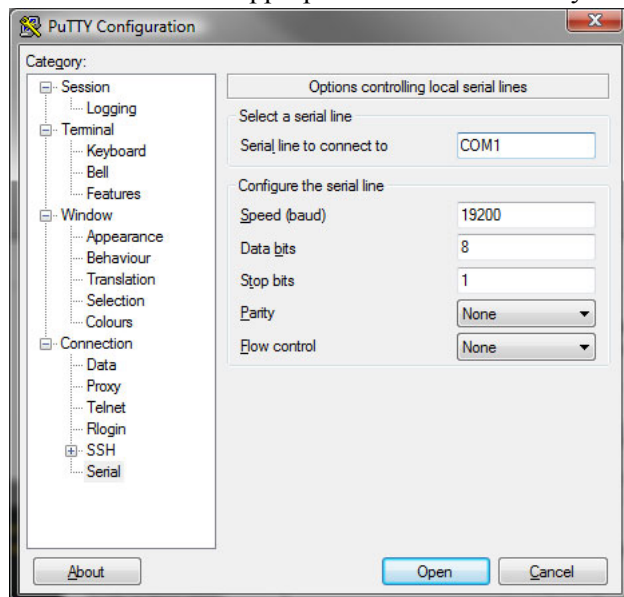
Note!

Use left and right navigation button to switch between two or more detectors when only one target is displayed.

Streaming values




With the Streaming value functionality, you can transfer data from the Display unit.

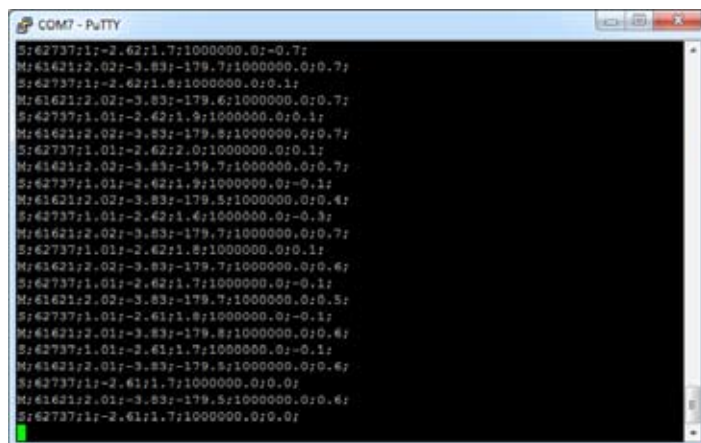
1. Connect the Display unit to the PC using the USB to USB cable. (For the most recent drivers browse to <http://www.ftdichip.com/>, look for 'USB to USB cable' and choose the appropriate VCP drivers for your operating system.)



The USB-to-USB cable shows up as a Virtual Serial Port with the following properties:
19200 bps, 8n1 without flow control.

The port number can, for example, be found using the Device Manager. See 'USB Serial Port' under 'Ports (COM and LPT)'.

2. Click Open.
3. Start the program Values in the Display unit.
4. Select  and  to start streaming values.
5. To stop, select .



In this example, PuTTY is used to show the streamed data

Data format

The data is sent as lines with semi colon separated values. Each line begins with a detector identification, S, M, Vib or BTA, followed by the detector serial number. The unit and resolution depends on the settings in the user profile.

Data from Vib: Vib;serial;LP;HP;G;

Data from BTA: BTA;serial;PSD1X;PDF2X;PDF3X;X axis angle;Y axis angle;Z axis angle;















Data from S: S;serial;PSD X; PSD Y; X axis angle;Y axis angle;Z axis angle;

Data from M: M;serial;PSD X; PSD Y; X axis angle;Y axis angle;Z axis angle;

HORIZONTAL

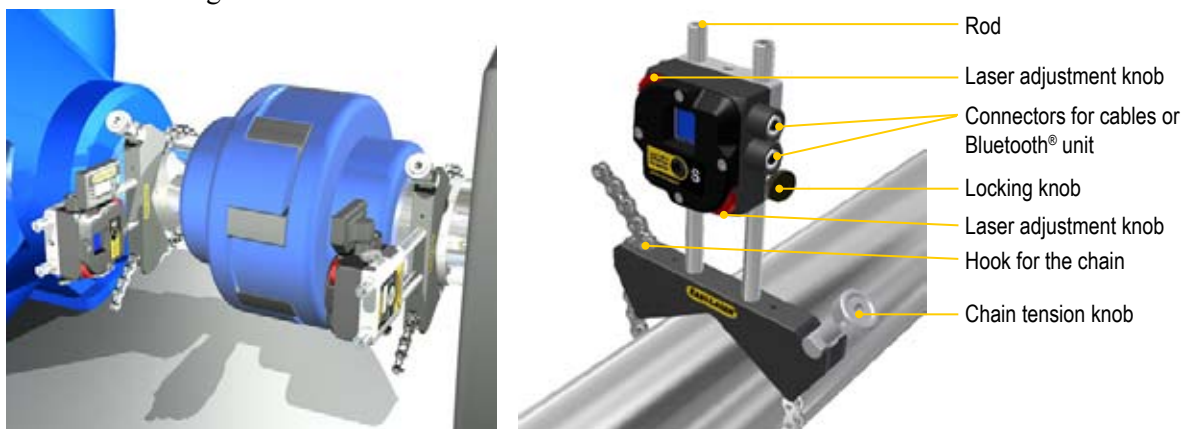


You can choose to measure with the 9-12-3 method where measuring positions are registered at positions 9, 12, 3 o'clock, or with EasyTurn, where you can start anywhere on the turn and measuring positions can be registered with as little as 20° between positions.

Preparations	Measure	Result/Adjustment
<ol style="list-style-type: none">1. Mount units2. Enter distances3. Rough alignment  Softfoot	<div> 9-12-3</div> <div> EasyTurn™</div> <div> Show M-unit</div> <div> Hide M-unit</div>	<div> Live at 12 or 6 o'clock.</div> <div> Live at 9 or 3 o'clock.</div> <div> Live anywhere.</div> <div> Live at 9, 12, 3 or 6 o'clock.</div> <div> Save</div> <div> Set tolerance</div> <div> RefLock</div> <div> Set thermal growth</div> <div> Set gap or angle</div>

Mount the units

1. Mount the S-unit on the stationary machine and the M-unit on the movable machine.
2. Mount the units facing each other. Make sure they are at the approximately same rotational angle and radius.



Mounted measuring units, image showing 2-axis measuring units

Connect cables or Bluetooth® units

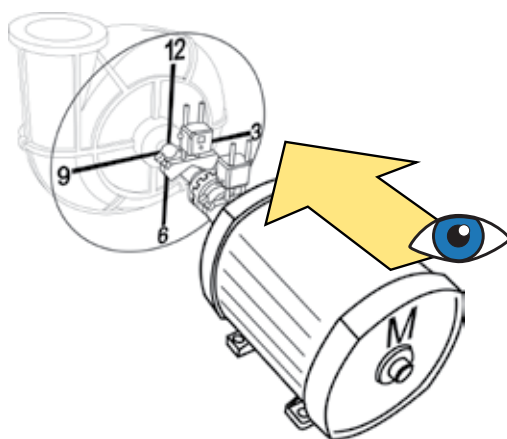
Cable

The measuring units has two connectors that are used for cables or Bluetooth® units.

1. Connect a cable to the Display unit. Connect the other end to any of the measuring units.
2. Connect the second cable between the measuring units.



Bluetooth®

The Display unit is equipped with Bluetooth® wireless technology, which makes it possible for the Display unit to receive data without using cables. For more information, see chapter *Display unit > Bluetooth®*.




Face the stationary machine (S) from the movable machine (M). Then 9 o'clock is to the left, as in the measuring programs.

Enter distances









1. Select  and  to open Horizontal program.
2. Enter distances. Confirm each distance with **OK**. The mandatory distances are needed for measuring the machine.

If you have a barcode reader, simply scan the barcode and all machine data is read. *See also Display unit > Measurement file handling.*



- 1 Distance between S-unit and M-unit.
Measure between the rods. **Mandatory**.
- 2 Distance between S-unit and centre of coupling. **Mandatory**.
- 3 Distance between M-unit and first feet pair.
- 4 Distance between feet pair one and feet pair two.
- 5 Coupling diameter. Optional, select  to activate field.

Function buttons

	Leave program.
	Control panel.
	Diameter. Select to enter coupling diameter. This is necessary if you want the result based on the gap of the coupling instead of angle.
	Contains a sub-menu.
	Show three feet pairs. Add a feet pair.
	Show two feet pairs.
	Toggle button. Show movable machine to the left or to the right.
	Continue. Available when you have entered the mandatory distances.

Accuracy of entered distances

When you enter the distances between the machine bolts to make it possible for the measurement system to calculate the adjustment values for F1 and F2, the values will also be affected by the width of the shims. If the foundation isn't straight and flat, the machine might rest on the edge of the shims, and not on the middle of it.

Conclusion: $\pm 10\%$ is acceptable when entering the distances, because this will affect the angular deviation very little, and because there are other factors that are hard to compensate exactly for.

Example

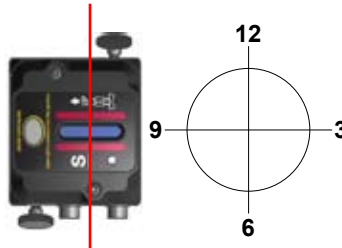
If the distance between S–M is 100 mm and you add an error of 10 mm, this will affect the measurement result by 10%. If the Display unit reads an angle of 0.10 mm/100, the reading will differ 0.01 mm/100 from correct value.

Rough alignment

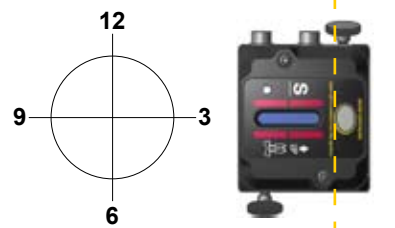
When making a new installation, a rough alignment can be necessary.

Place the Measuring units on the rods, make sure they are at the approximately same rotational angle and radius. Also make sure that the adjustment knob is adjustable in both directions.

1. Place the Measuring units at 9 o'clock. Adjust the laser line to the centre of both targets. Use the adjustment knobs and/or move the detectors on the rods.



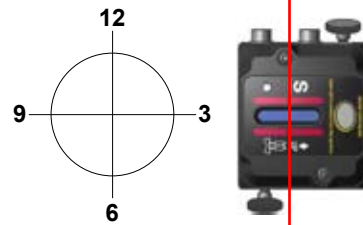
2. Turn the shafts 180°. Make a mark on the rods or machine halfway between the laser line and centre of both targets.



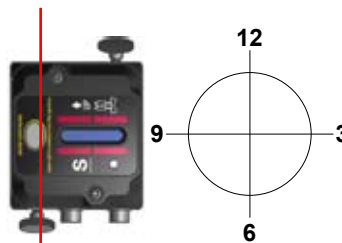
3. Adjust the laser beams half way to the centre of targets. Use the adjustment knobs and/or move the detectors on the rods.



4. Adjust the movable machine until the laser beam hits the centre of both targets.



5. Turn the shafts 180°. Check if both laser lines hit the targets. If not, repeat step 3–5.

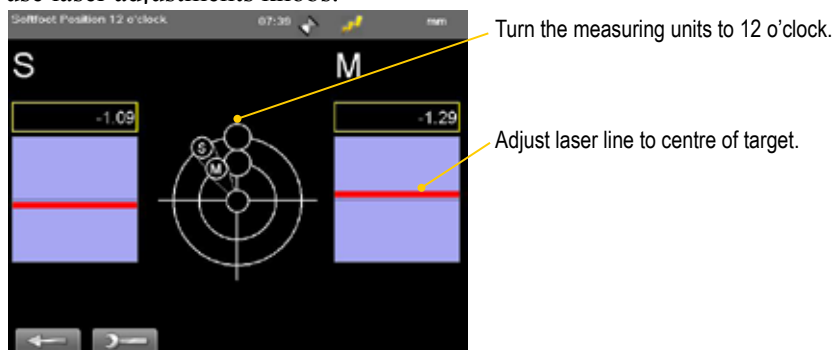


Turn shafts to 12 o'clock. Repeat all steps for vertical adjustment.

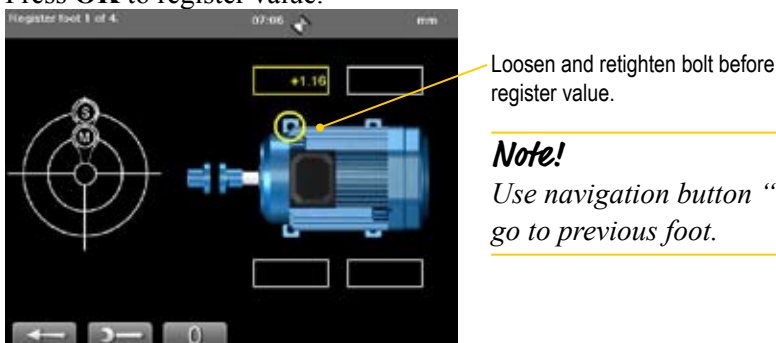
Softfoot

Perform a softfoot check to ensure that the machine is resting evenly on all its feet.

1. Select and to open Horizontal program.
2. Enter distances. Confirm each distance with **OK**. To perform a Softfoot check, you need to enter distances between the feet pairs. The measure view is displayed.
3. Select . Softfoot is only available before you have registered any measurement points.
4. Tighten all feet bolts.
5. Turn the shaft with measuring units to 12 o'clock.
6. Adjust laser to the centre of targets. If needed, adjust the units on the rods, then use laser adjustments knobs.



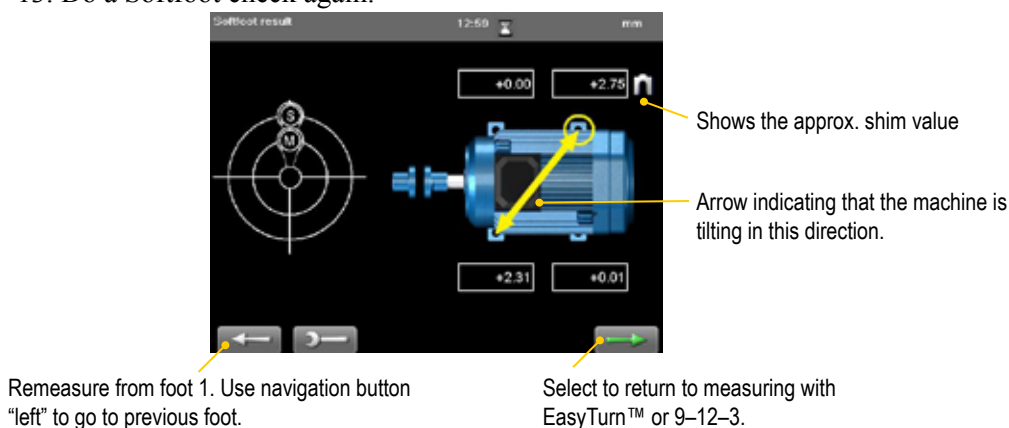
7. Press **OK**. The first bolt is marked with yellow.
8. Press to zero set.
9. Loosen and then retighten the first bolt.
10. Press **OK** to register value.



Note!

Use navigation button "left" to go to previous foot.

11. Repeat step 8 and 10 on the following feet. A result is displayed.
12. Shim the foot with the largest movement.
13. Do a Softfoot check again.



If the largest movement is opposite from the smallest it is not a conventional softfoot and you will be asked to check the foundation.


EasyTurn™ method

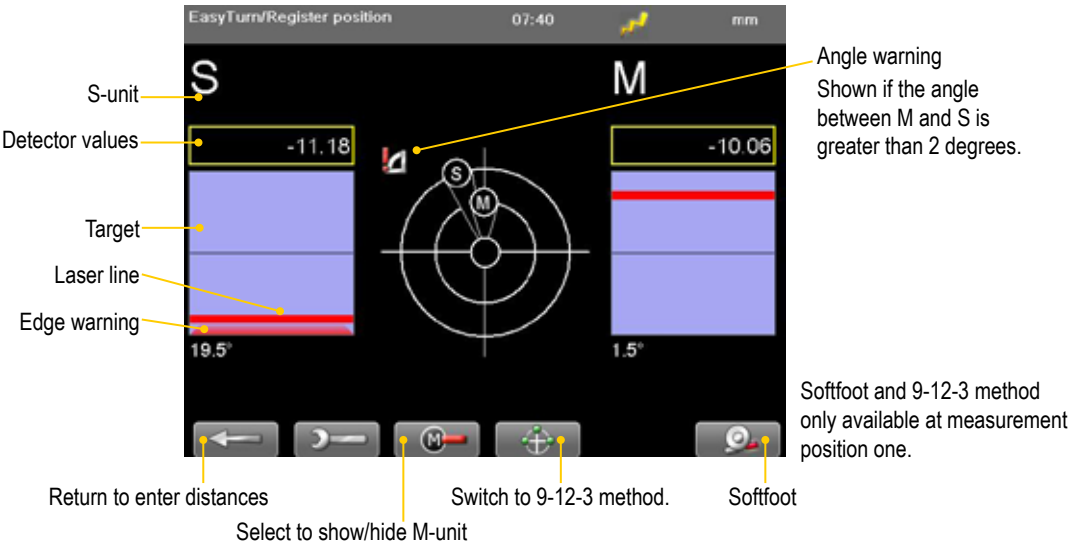
Preparations

Follow the preparations as described in the previous chapter.






- 1. Mount the measuring units.
- 2. Connect cables or Bluetooth® units.
- 3. Enter distances, confirm each distance with **OK**.
- 4. If needed, perform a rough alignment.
- 5. If needed, perform a Softfoot check.

Measure

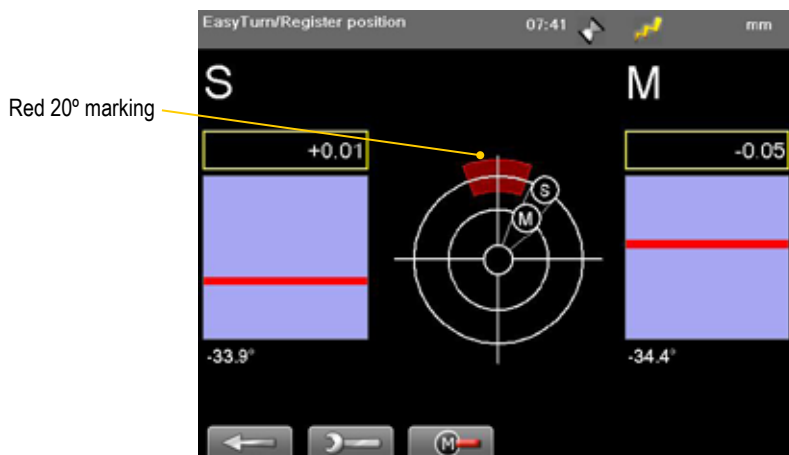
By default, the EasyTurn™ alignment method is displayed. If you want to use the 9-12-3 method, select .




Function buttons

	Back. Return to enter distances.
	Open Control panel.
	Toggle button. Select to show/hide M-unit. Show M-unit if you have uncoupled shafts.
	Switch to 9-12-3 method.
	Open Softfoot view. Perform a softfoot check. Only available at measurement position 1. <i>See chapter Softfoot.</i>

1. Adjust laser to the centre of the PSD targets. If needed, adjust the units on the rods, then use laser adjustments knobs.
2. Press **OK** to register first position. The first position is automatically set to zero. A red marking is displayed.
3. Turn shafts outside of the red 20° marking.
4. Press **OK** to register second position.
5. Turn shafts outside of the red markings.
6. Press **OK** to register third position.
7. The result is displayed.



Uncoupled shafts

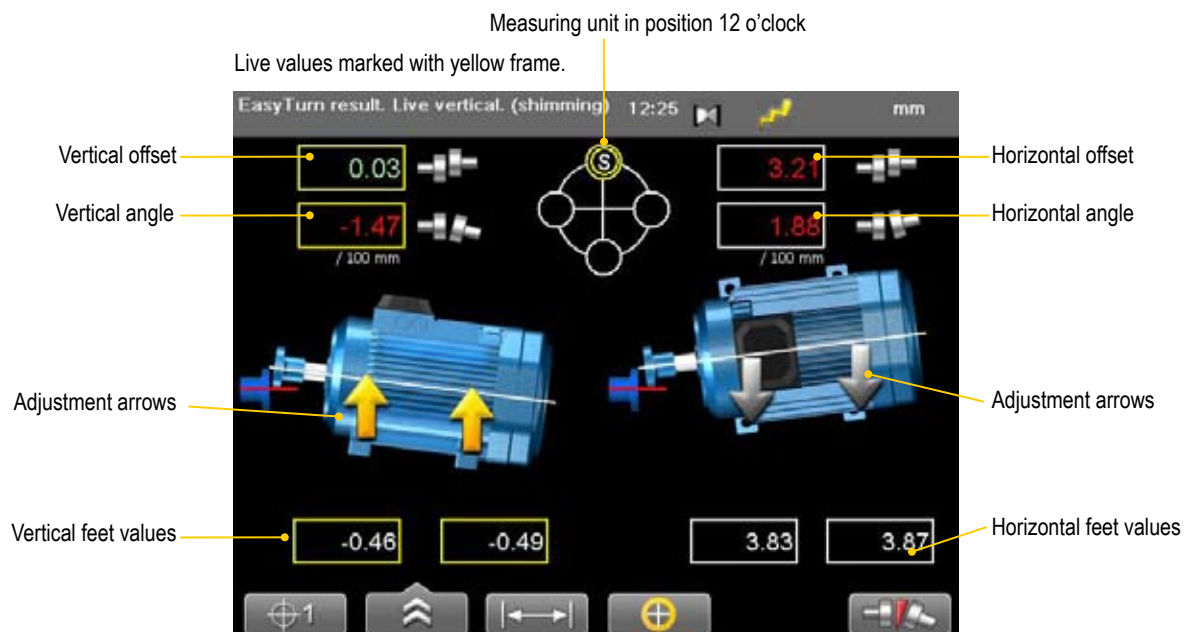
1. Select  to show M-unit.
2. Position the M-unit so it faces the S-unit. For best result, make sure the difference between the inclinometer values is no more than 0.1°. For large shafts, this accuracy is even more important.

Edge warning

When the laser beam is close to the edge, the edge is “lit up” as a warning. It is not possible register values when you see the edge warning.

Result

Offset, angle and feet values are clearly displayed. Both horizontal and vertical direction are shown live, which makes it easy to adjust the machine. Values within tolerance are green.

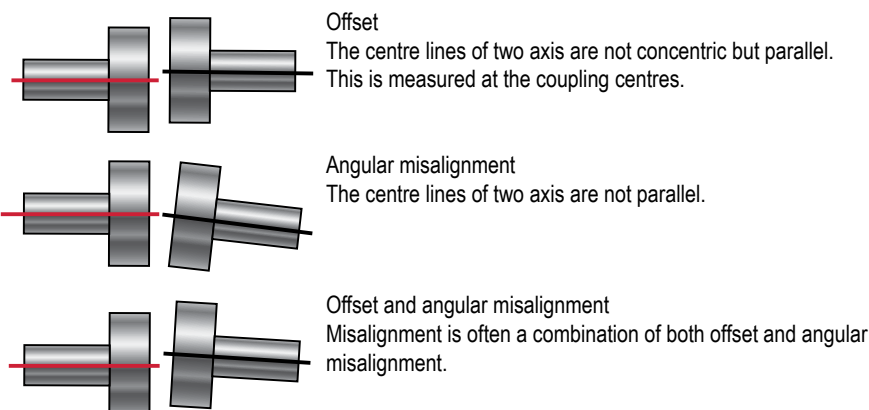


Function buttons

	Remeasure from measurement position one. All entered distances are kept.
	More. Select to display a sub-menu.
	Open Control panel. See <i>User interface > Control panel</i> .
	Save file. See <i>User interface > Measuring file handling</i> .
	Set tolerance. You can set the tolerance for the machine. If the machine is within tolerance, the numbers are green. If the numbers turn red, the machine needs adjustment. See <i>Tolerance</i> .
	Set thermal growth. See <i>Thermal growth</i> .
	Set RefLock. See <i>RefLock (Locked feet)</i> .
	Show target. This is a quick way to see where the laser beam hits the target and how the measuring units are positioned.
	Print report on thermal printer (optional equipment). Available when you open a saved measurement.
	Generate report. Available when you open a saved measurement.
	Edit distances. Press OK to confirm changes. The result is recalculated.
	Toggle button. Switch between showing live values at position 9, 12, 3 and 6 o'clock or live values at any angle. See <i>Live values on next page</i> .
	Toggle button. Switch between to show gap and show angular error per 100 mm. For this to work you need to set the coupling diameter.

Offset and angle values

The offset and angle value indicate how well the machine is aligned at the coupling. They appear in both horizontal and vertical direction.



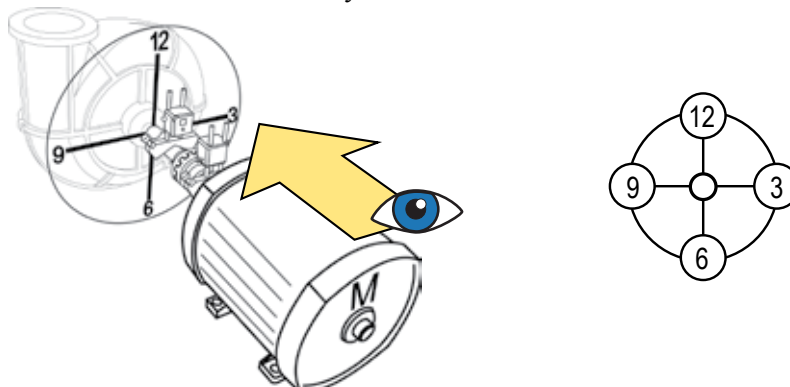
Feet values

The feet values show the position of the machine where the adjustment is made.

Live values


When reading the values, face the stationary machine from the movable machine. Positions for measuring units as seen from the movable machine.

Live values are marked with yellow frame.




Face the stationary machine (S) from the movable machine (M). Then 9 o'clock is to the left, as in the measuring programs.

Live values at positions 9, 12, 3 and 6

Select  to show vertical or horizontal values.


- Vertical values are live with the units in position 12 or 6 o'clock.
- Horizontal values are live with the units in position 9 or 3 o'clock.

Live values at any angle

Select  to show live values no matter where the units are positioned.

Adjustment

Adjust the machine if needed.

1. Shim the machine according to the vertical feet values.
2. Adjust the machine sideways according to the live horizontal values.
3. Tighten the feet.
4. Select  to remeasure.


9-12-3 method

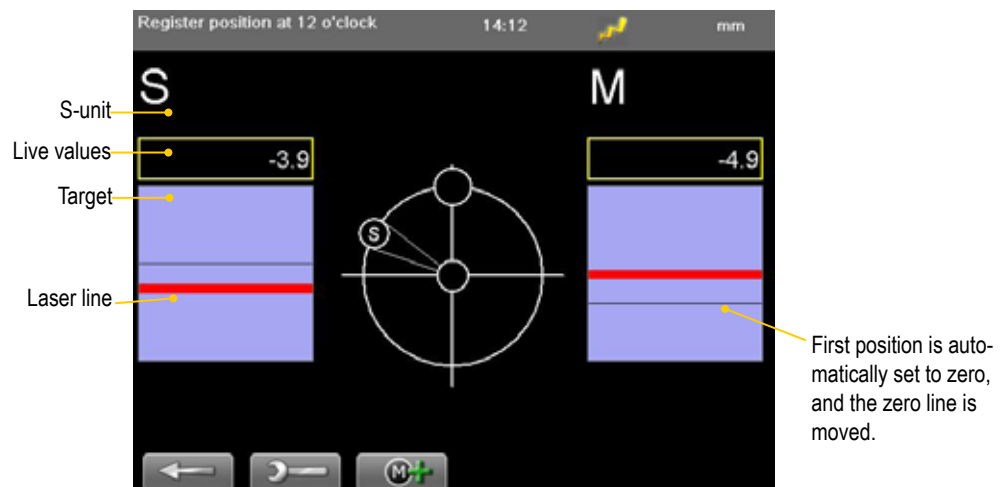
Preparations

Follow the preparations as described in the previous chapter.







1. Mount the measuring units.
2. Connect cables or Bluetooth® units.
3. Enter distances, confirm each distance with **OK**.
4. If needed, perform a rough alignment.
5. If needed, perform a Softfoot check.

Measure


1. Select  to switch to 9-12-3.
2. Turn shafts to 9 o'clock.
3. Use laser adjustments knob to adjust the laser to the centre of the targets. If needed, adjust the units on the rods.
4. Press **OK** to register first position. The first position is automatically set to zero.
5. Turn shafts to 12 o'clock.
6. Press **OK** to register second position.
7. Turn shafts to 3 o'clock.
8. Press **OK** to register third position.
9. The result is displayed.



Function buttons

	Back. Return to enter distances.
	Open Control panel.
 	Toggle button. Select to show/hide M-unit. Show M-unit if you have uncoupled shafts.
	Switch to EasyTurn™ method.
	Open Softfoot view. Perform a softfoot check. Only available at measurement position 1.

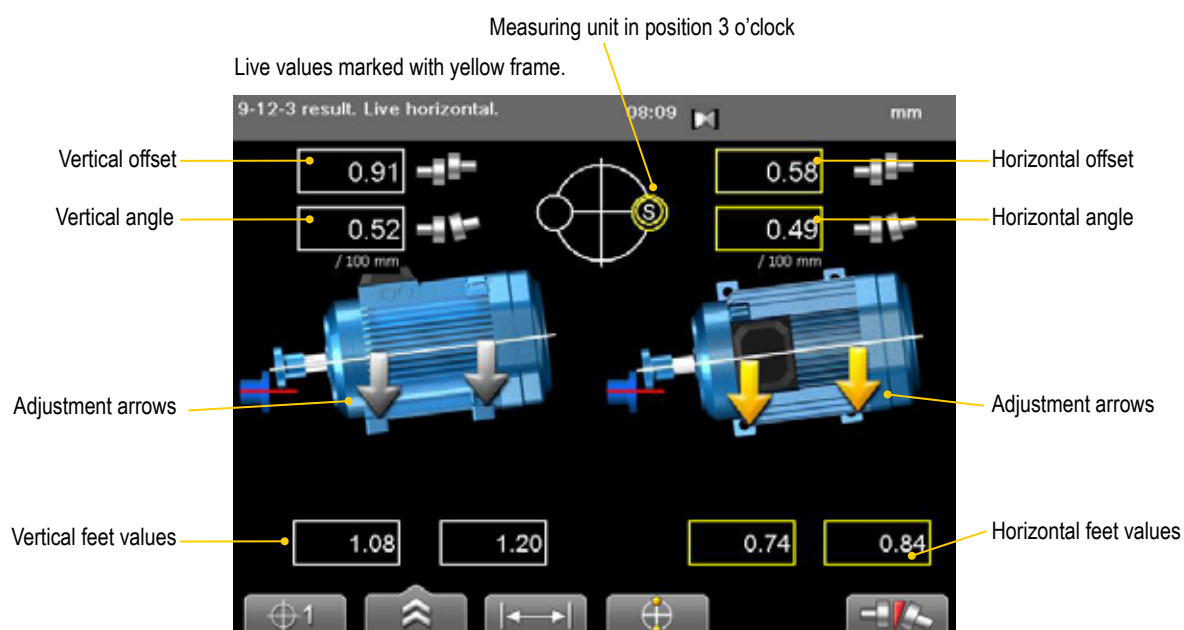
Uncoupled shafts

1. Select  to show M-unit.
2. Place M-unit so it faces the S-unit. If the laser from the S-unit hits the edge on the M-unit, **adjust the M-unit's position**.

Edge warning

When the laser beam is close to the edge, the edge is “lit up” as a warning. It is not possible register values when you see the edge warning.

Result



Function buttons





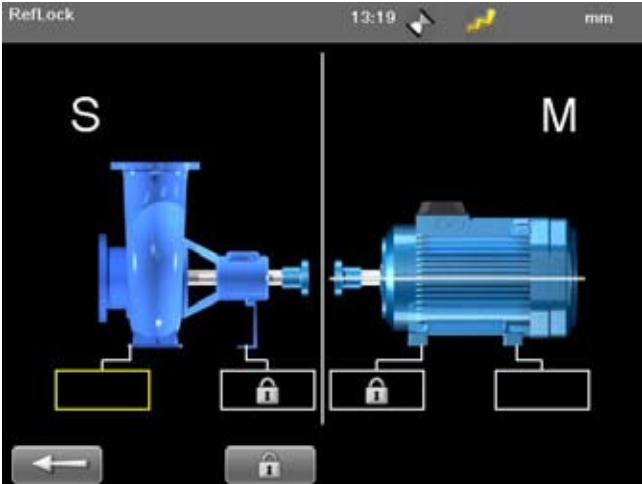
Toggle button. Switch between showing horizontal or vertical live values.

For more information regarding function buttons and result, see *EasyTurn > Result*.



RefLock™ (Locked feet)

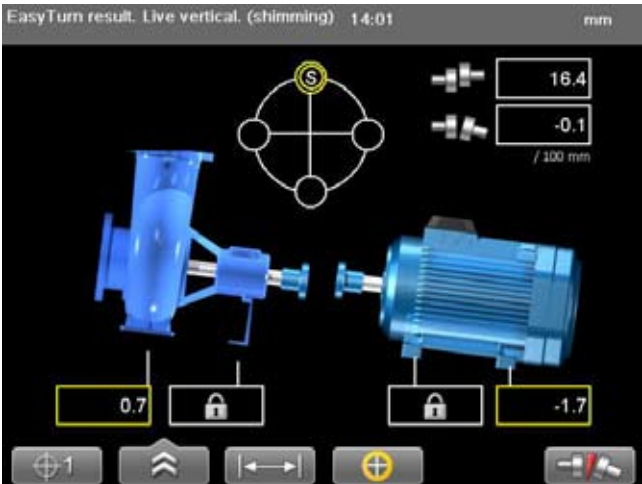
From the result view, you can select the function RefLock™. Here you can choose any two feet pairs as locked and choose which machine is to be used as stationary and which as adjustable.

- 1. Select  and  from the result view. The Edit distance is displayed.
- 2. Enter distances for the S-machine. The RefLock view is displayed.





RefLock view

- 3. Navigate using the left and right navigation button.
- 4. Select  to lock the selected feet pair.
- 5. Select  to unlock.
- 6. Press OK to save changes and return to the result view.



Result view with locked feet

Function buttons



	9-12-3 program Toggle button. Switch between showing horizontal or vertical live values.
	EasyTurn™ program Toggle button. Switch between live values at position 9, 12, 3 and 6 o'clock or live values at any angle.

Note!

RefLock™ is available when using the program Horizontal. Not available for programs Vertical or Cardan.

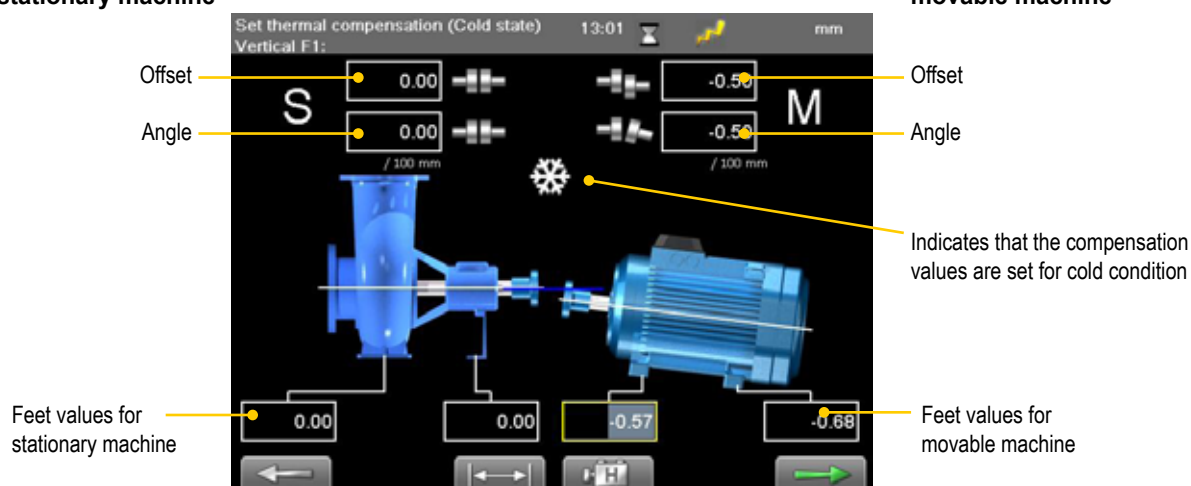
Thermal growth

During normal operation, machinery is influenced of different factors and forces. The most common of these changes is the change in the temperature of the machine. This will cause the height of the shaft to increase. This is called thermal growth. To compensate for thermal growth, you enter values for cold condition compensation.




Select  and  from the result view. The Thermal compensation view is displayed. You can enter compensation values for on the coupling **or** the feet values.

Coupling values for stationary machine



Coupling values for movable machine





Function buttons

	Edit distances.
	Toggle button. Enter horizontal or vertical values.
	Select to go back to the result view.

Coupling values

1. Enter a value for offset and/or angle. Use navigation buttons to move between fields.
2. Press **OK**. The feet values are recalculated.
3. Select  if you want to enter horizontal values.
4. Select  to save changes and return to the result view. *See next page.*

Feet values

1. Use the navigation buttons to move between fields.
2. Enter a feet value. The values for offset and angle are recalculated.
3. Select  if you want to enter horizontal values.
4. Select  to save changes and return to the result view. *See next page.*

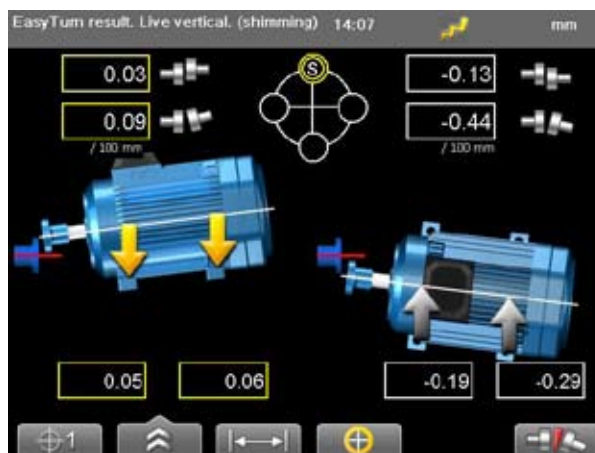
Note!

Thermal growth is available when using the program Horizontal. Not available for programs Vertical or Cardan.



Thermal compensation example

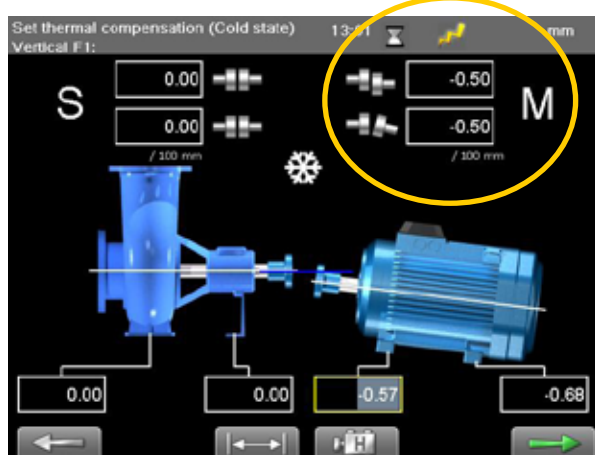
Some machine manufacturers can inform you how much their machines need to be compensated for thermal growth. For example, it can be necessary to place the cold machine a bit lower to allow thermal growth. When the machine becomes warm, the thermal growth will make it perfectly aligned.

1. Make a measurement using EasyTurn or 9-12-3 method. The result view is displayed.




Result view, no thermal compensation

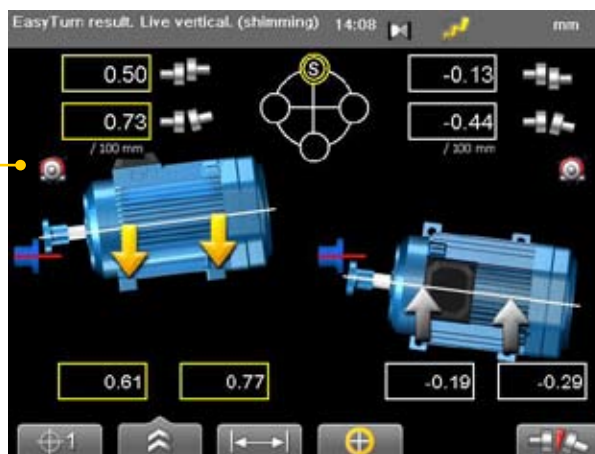
2. Select  and . In this example we set -0.5mm as vertical compensation, both offset and angle.



Vertical thermal compensation

3. Select  to save changes and return to the result view. When you have set thermal compensation and return to the result view, the values have changed. In this example you need to lower the machine.

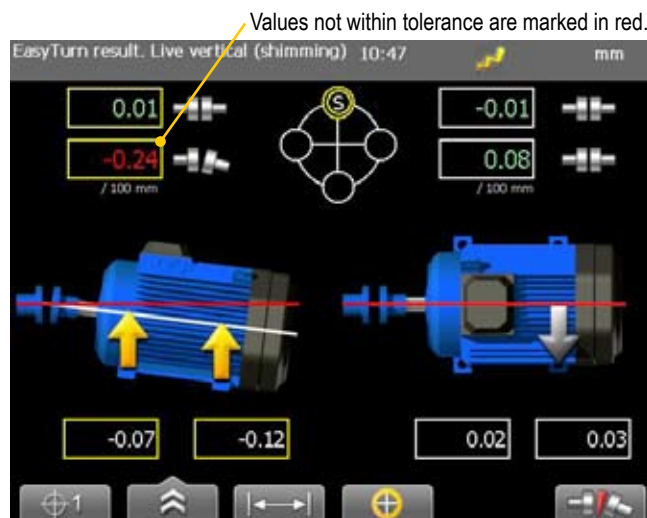
Indicates that thermal compensation has been set



Result view, vertical thermal compensation set

Tolerance

The measurement result can be checked against predefined tolerance tables or values that you determine yourself. This way you can quickly see if the alignment is within tolerance.



1. Select and to open tolerance table.
2. Use navigation buttons to navigate in the table.
3. Press **OK** to confirm.

Set tolerance 06:50 mm

Unit and resolution 0.01 mm

RPM	Offset	Angular error / 100 mm
No tolerance	---	---
0-1000	0.09	0.09
1000-2000	0.07	0.07
2000-3000	0.05	0.05
3000-4000	0.03	0.03
4000-	0.01	0.01

Gap or angular error

Select to switch between showing gap or angular error per 100 mm. To show gap, you need to set the coupling diameter when you enter distances.

User defined tolerance

1. Select to define your own tolerance.
2. Enter your tolerance for offset and angular error.
3. Press **OK**. Your user defined tolerance is added to the list.

Enter tolerance - Offset:

Enter tolerance - Angular displacement: / 100

Tolerance table

The rotation speed of the shafts will decide the demands on the alignment. The table on this side can be used as a guidance if no other tolerances is recommended by the manufacturer of the machines.

The tolerances is set to the maximum allowed deviation from accurate values, with no consideration to if that value should be zero or compensated for thermal growth.

Offset misalignment

rpm	Excellent		Acceptable	
	mils	mm	mils	mm
0000-1000	3.0	0.07	5.0	0.13
1000-2000	2.0	0.05	4.0	0.10
2000-3000	1.5	0.03	3.0	0.07
3000-4000	1.0	0.02	2.0	0.04
4000-5000	0.5	0.01	1.5	0.03
5000-6000	<0.5	<0.01	<1.5	<0.03

Angular misalignment

rpm	Excellent		Acceptable	
	mils/°	mm/100mm	mils/°	mm/100mm
0000-1000	0.6	0.06	1.0	0.10
1000-2000	0.5	0.05	0.8	0.08
2000-3000	0.4	0.04	0.7	0.07
3000-4000	0.3	0.03	0.6	0.06
4000-5000	0.2	0.02	0.5	0.05
5000-6000	0.1	0.01	0.4	0.04



The higher the rpm of a machinery is, the tighter the tolerance must be. The acceptable tolerance is used for re-alignments on non-critical machinery. New installations and critical machines should always be aligned within the excellent tolerance.

VERTICAL

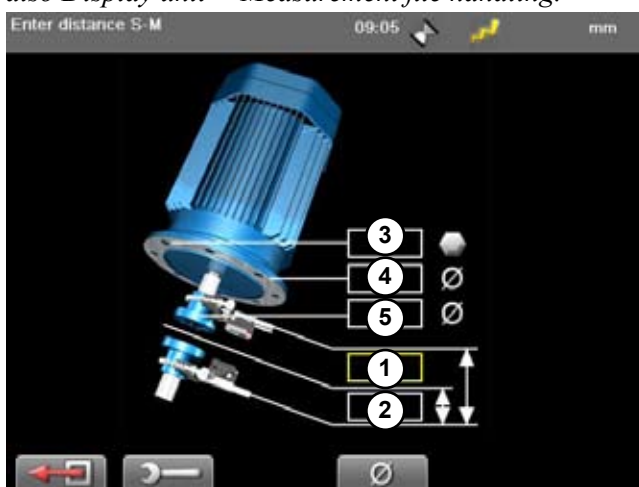



The program Vertical is used for vertical and/or flange mounted machines.

Preparations




1. Mount the M-unit on the movable machine and the S-unit on the stationary machine.
2. Select  and  to open Vertical program.
3. Enter distances. Confirm each distance with **OK**.

If you have a barcode reader, simply scan the barcode and all machine data is read. *See also Display unit > Measurement file handling.*



- 1** Distance between S-unit and M-unit.
Measure between the rods. **Mandatory**.
- 2** Distance between S-unit and centre of coupling. **Mandatory**.
- 3** Number of bolts (4, 6 or 8 bolts).
- 4** Bolt circle diameter (centre of the bolts).
- 5** Coupling diameter. Select  to activate field.

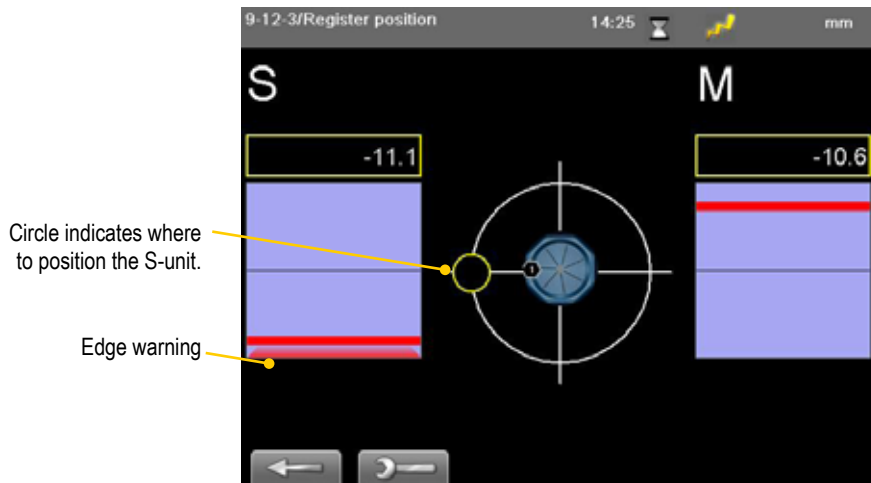
Function buttons

	Leave program.
	Open Control panel.
	Select to enter diameter of coupling.

Measure

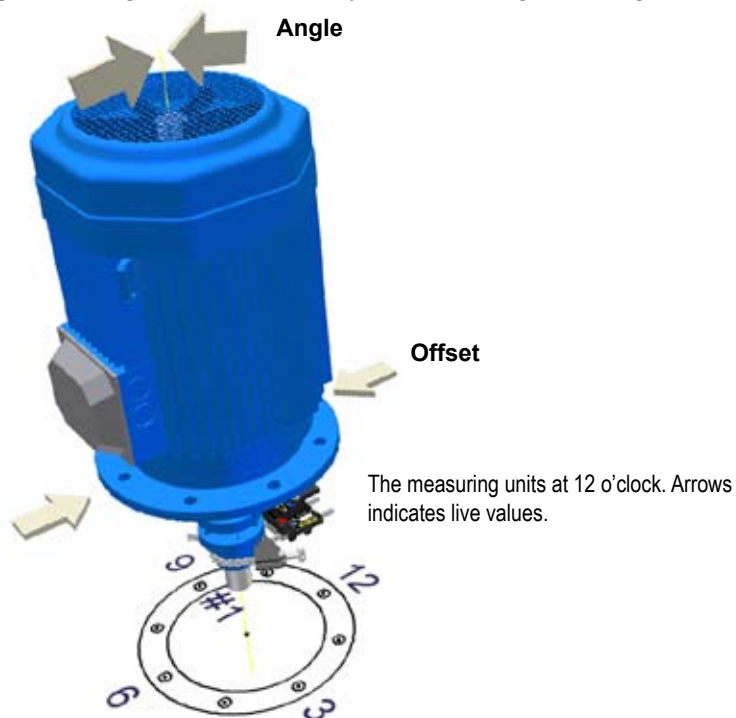
The program Vertical uses the 9-12-3 method.

1. Position the units at 9 o'clock, at bolt number one. Make sure that it is possible to also position the units at 12 and 3 o'clock.
2. Press **OK** to register first position. The first position is automatically set to zero.
3. Turn units to position 12 o'clock.
4. Press **OK** to register position.
5. Turn units to position 3 o'clock.
6. Press **OK** to register position. Measurement result is displayed.



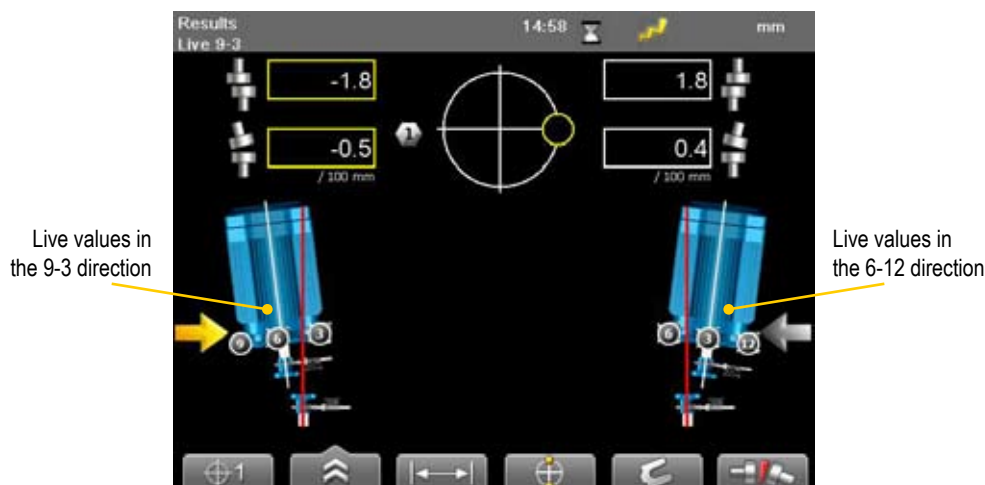
Edge warning

When the laser beam is close to the edge, the edge is “lit up” as a warning. It is not possible register values when you see the edge warning.





Result

The result is displayed as sideways offset in the coupling and angular error between shafts.
















Live values

The values can be displayed live in two directions:

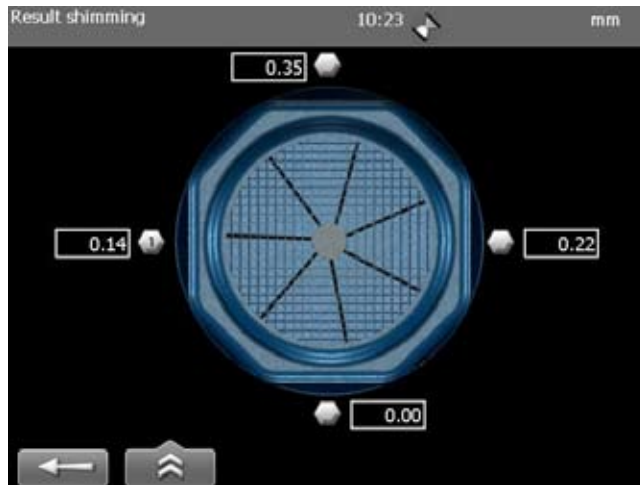
- Live in the 9-3 direction.
Select  and position the measuring units at 3 o'clock.
- Live in the 6-12 direction.
Select  and position the measuring units at 12 o'clock.



Function buttons

	Back
	More. Select to display a sub-menu.
	Open Control panel.
	Save file.
	Set tolerance.
	Show target. This is a quick way to see where the laser beam hits the target and how the measuring units are positioned.
	Print report on thermal printer (optional equipment).
	Adjust distances. Press OK to confirm changes. The result is recalculated.
 	Toggle button. Switch between showing live values in the direction 9-3 or 6-12.
	<i>See Shim result on next page.</i>
 	Toggle button. Switch between to show gap and show angular error per 100 mm. For this to work you need to set the coupling diameter.

Shim result view

To view this, you need to enter number of bolts and diameter of bolt circle.



1. Select  to open Shim value view. The values are not live.
2. Read values. The highest bolt is calculated as 0.00. Values below zero indicates that the bolt is low and need shimming.
3. Select  to return to Result view.

Note!

If you shim the machine, remeasure from position 9 to update all measurement values.

Adjust machine

1. Compare the offset and angular error to the tolerance demands.
2. If the angular error need to be adjusted, please shim the machine first, then adjust the offset.
3. Tighten the bolts and remeasure.



Easy-Laser® BTA system consists of a laser transmitter and a detector. Magnetic mountings on laser and detector make it easy to mount the equipment. Non-magnetic sheave/pulleys can be aligned as the units are very light and can be mounted using double-sided tape.

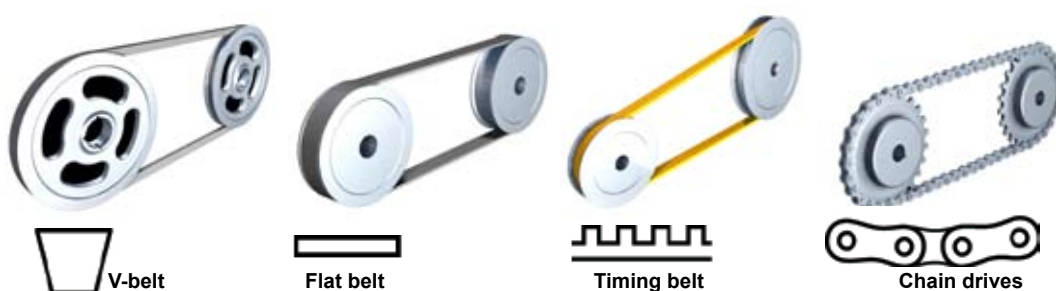
Note!

BTA is not included in all Shaft systems.

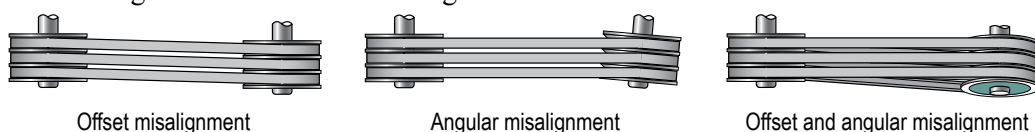
See also Technical data > BTA.



All types of sheave/pulleys can be aligned, regardless of belt type. You can compensate for sheaves of varying widths.



The misalignment can be offset or angular. It can also be a combination of both.



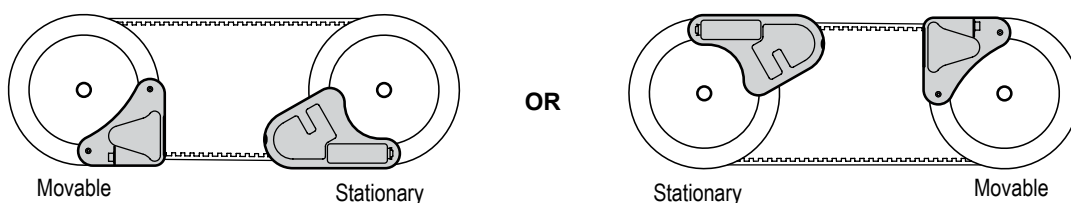
Preparations

- Check the sheaves for radial runout. Bent shafts will make it impossible to perform an accurate alignment.
- Check the sheaves for axial runout. If possible, adjust with the mounting screws of the bushings.
- Make sure that the sheaves are clean from grease and oil.

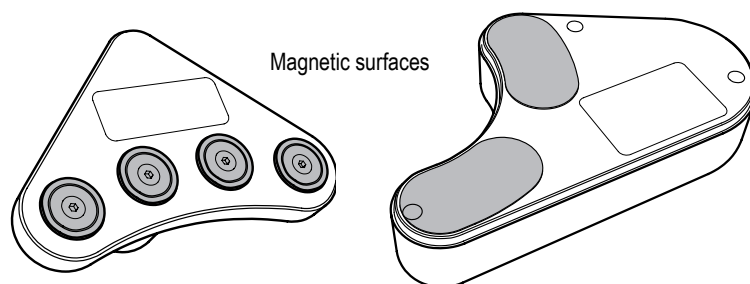
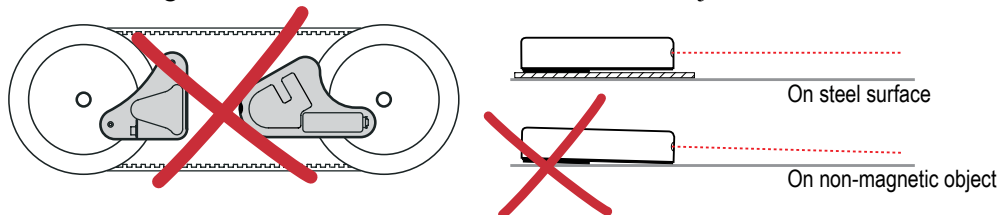
Mount the units

The units are mounted on a flat machined surface with magnets. The magnets are very strong, try to soften the touch to the by putting just one magnet to sheave first, then turning the other ones in.



1. Mount the laser transmitter on the stationary machine.
2. Mount the detector on the movable machine.
3. Make sure all magnetic surfaces are in contact with the sheave.

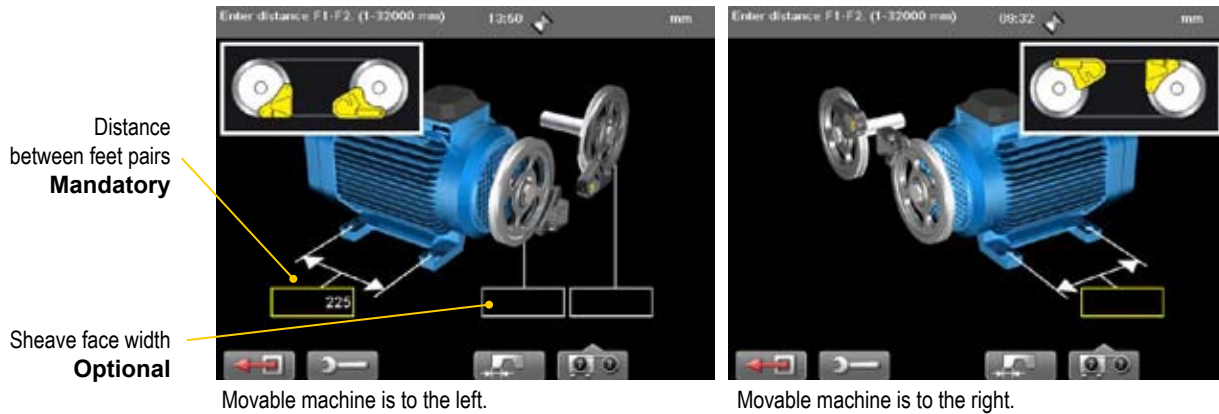


All of the magnetic surfaces must be in contact with the object.










Enter distances

1. Connect to the Display unit via cable or use Battery pack with Bluetooth®.
2. Press the ON button on the laser transmitter.
3. Select  to open the BTA program.
4. Select  if you want to enter sheave face width. Press **OK**.
5. Enter distance between feet pairs. Press **OK**.




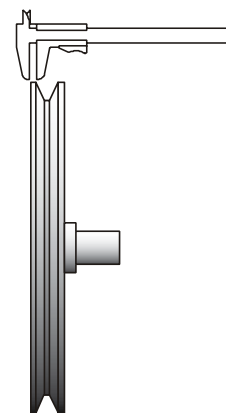
Function buttons

	Leave program.
	Open Control panel.
	Sheave face width. Select to activate fields if the sheaves have different face widths.
	Contains a sub menu. The Display unit automatically recognize where the units are placed. However, you can do this manually as well.  Set M-unit to the left.  Set M-unit to the right.  Return to Automatic configuration.

Sheave face width

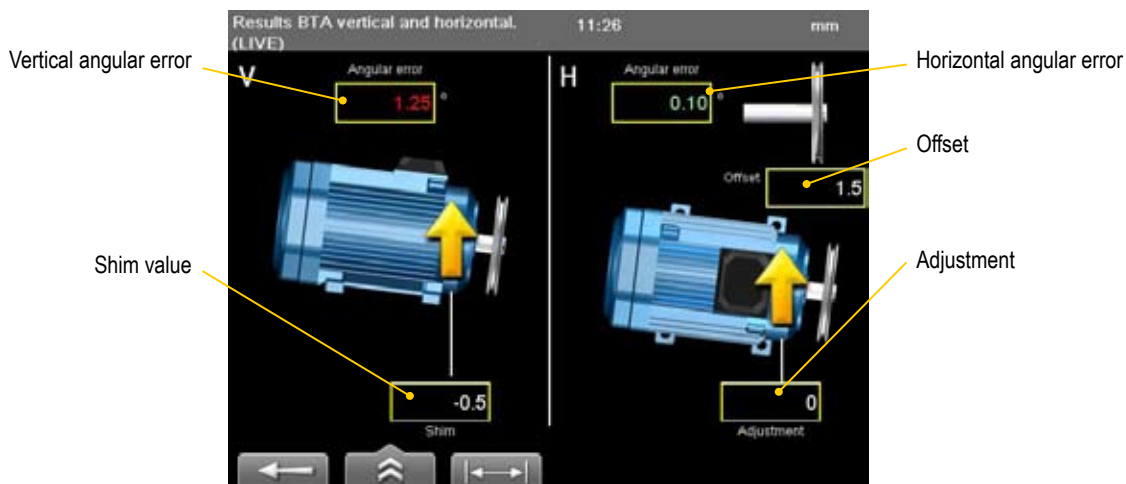
The distance from the belt to the axial face of the sheave can be different on the two sheaves. To calculate a possible offset the system requires both sheave face widths.

1. Measure the distance from the belt to the axial face of the sheave.
2. Select  to activate fields and enter distances.










Measure

Make sure that the laser line hits the detector aperture. The Display unit shows the offset and angular misalignment.



Function buttons

	Back. Return to enter distances.
	Contains a sub-menu.
	Open Control panel.
	Save. See also <i>Display unit > Measurement file handling.</i>
	Set tolerance. See also <i>Tolerance on next page.</i>
	Print on thermal printer (Optional equipment). Available when you have saved the measurement.
	Edit distance.

Values – colours

White	No tolerance set.
Green	Value within tolerance.
Red	Value outside tolerance.
++++	Loss of signal, laser beam interrupted for example.

Note!


The laser transmitter flashes when the battery is low. Change the batteries before you continue to measure.

Tolerance

Recommended maximum tolerances from manufacturers of belt transmissions depends on type of belt, usually between 0.25–0.5°.

1. Select . The tolerance view is displayed.



2. Select  to set user defined tolerance.

Adjust

Start by adjusting the sheave, and then the machine.

- Correct offset by moving the movable machine with axial jackscrews, or by repositioning one of the sheaves on its shaft.
- Correct vertical angular error by shimming the movable machine.
- Correct horizontal angular error by adjusting the movable machine with lateral jackscrews.

When you adjust the machine one way, it often affects the machine's other alignment conditions. Which means this process may have to be repeated several times.

Note!

If not using the system for a long period of time, remove the batteries.

VIBROMETER



Easy-Laser® Vibrometer is used in preventive as well as active maintenance work on rotating machinery. It measures the vibration level and bearing condition of machinery.

When measuring vibration level, Easy-Laser® Vibrometer is measuring the effective velocity (mm/s or inch/s RMS) in the frequency range between 2 and 3200 Hz. This range covers most of the frequencies that will occur for the majority of mechanical malfunctions and imperfections, for example unbalance and misalignment.

When used to measure bearing condition the Easy-Laser Vibrometer is measuring the effective acceleration (RMS) in the frequency range between 3200 and 20000 Hz. Trend analysis of the bearing condition value can be used to determine wear and tear of machine bearings.



See also Technical data > Vibrometer.

Mount directly on machine

It is possible to remove the magnetic tip and mount the probe directly to the machine, using the M6 threaded stud.


Measuring tip

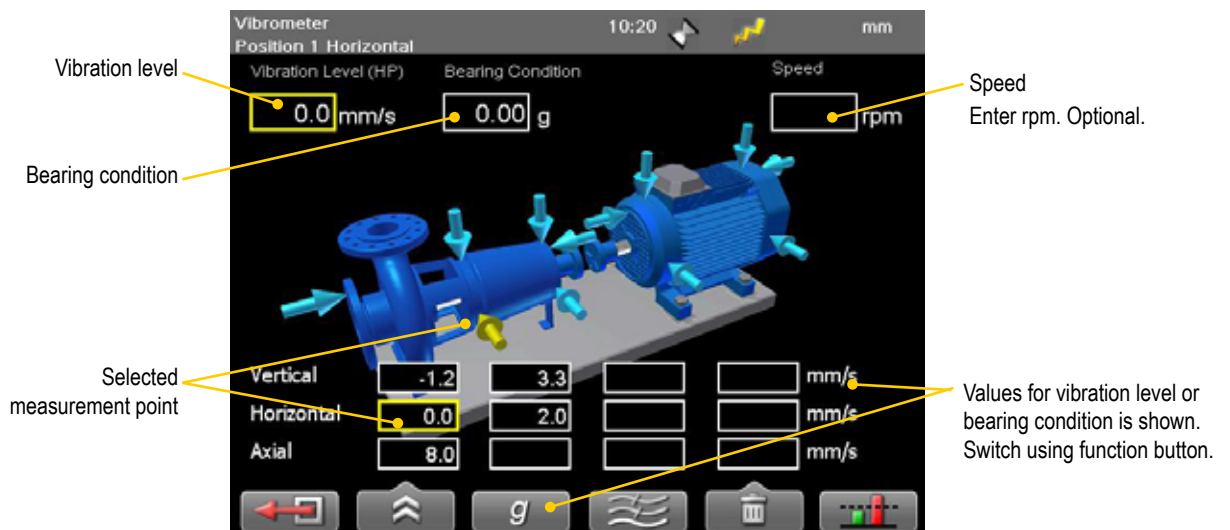
For measuring points that are hard to reach, use the measuring tip. Simply unscrew the magnetic tip and replace with the measuring tip. When measuring with the measuring tip, place it firmly against the measurement point and hold it as vertical, horizontal or axial as possible. When the measuring tip is used the frequency range is reduced to about 800 to 1500Hz.

Note!













Vibrometer is not included in all Shaft systems.

Measure

1. Use the standard red cable to connect the Vibrometer directly to the Display unit.
Wireless units cannot be used.
2. Select  to open the Vibrometer program.
 - Enter rpm. Optional.
 - Use the navigation buttons if you want to register another point than is selected by default.
3. Place the vibrometer against the measurement point. Pressing more firmly should not change the reading. If this happens, adjust the measuring point.
4. Wait a few seconds for the value to stabilize.
5. Press **OK** to register value.




Function buttons

	Leave program.
	Contains a submenu
	Open Control panel.
	Save. See also <i>Measurement file handling</i> .
	Print report on thermal printer (optional equipment).
	Generate report. Available when you open a saved measurement.
	Toggle button. Show values for bearing condition or vibration level.
	Toggle button. Show high frequency (10–3200 Hz) or low frequency (2–3200 Hz).
	Contains a submenu
	Clear selected measurement point.
	Clear all measurement points.
	Tolerance. Show tolerance table for vibration level and bearing condition value.

Vibration level

In the Display unit, a table from ISO 10816-3 standard is shown. This standard is used for machines with power above 15kW and nominal speeds between 120–15000 rpm.

1. Use navigation buttons to select a measurement point.
2. Select  to open the tolerance table. It displays the values for the selected point.



Rigid or flexible

The ISO standard is classifying the machines differently if the machines have flexible or rigid foundations. Usually this is determined from drawings and calculations of the machine.

Groups

- Group 1. Large machines with rated power above 300kW. Electrical machines with shaft height $H > 315\text{mm}$. Operating speed ranges from 120 to 15000 rpm
- Group 2. Medium-sized machines with a rated power above 15kW up to and including 300kW. Electrical machines with shaft height between $160 < H < 315\text{ mm}$. Operating speed normally above 600 rpm.
- Group 3. Pumps with multivane impeller and with separate driver with rated power above 15kW.
- Group 4. Pumps with multivane impeller and with integrated driver with rated power above 15kW.

Guideline

Another standard you can use is ISO 2372 class 4, for large machines on flexible foundations.

0 – 3 mm/s 0 – 0.12inch/s	Small vibrations. None or very small bearing wear. Low noise level.
3 – 7 mm/s 0.12 – 0.27 inch/s	Noticeable vibration levels often concentrated to some specific part as well as direction of the machine. Noticeable bearing wear. Seal problems occur in pumps etc. Increased noise level. Plan action during next regular stop. Keep the machine under observation and measure at smaller time intervals than before to detect a deterioration trend if any. Compare vibrations to other operating variables.
7 – 18 mm/s 0.27 – 0.71 inch/s	Large vibrations. Bearings running hot. Bearing wear-out cause frequent replacements. Seals wear out, leakage of all kinds evident. Cracks in weldings and concrete foundations. Screws and bolts are loosening. High noise level. Plan action soonest.
> 18 mm/s > 0.71 inch/s	Very large vibrations and high noise levels. This is detrimental to the safe operation of the machine. Stop operation if technically or economically possible considering the plant stop cost.


Bearing condition value

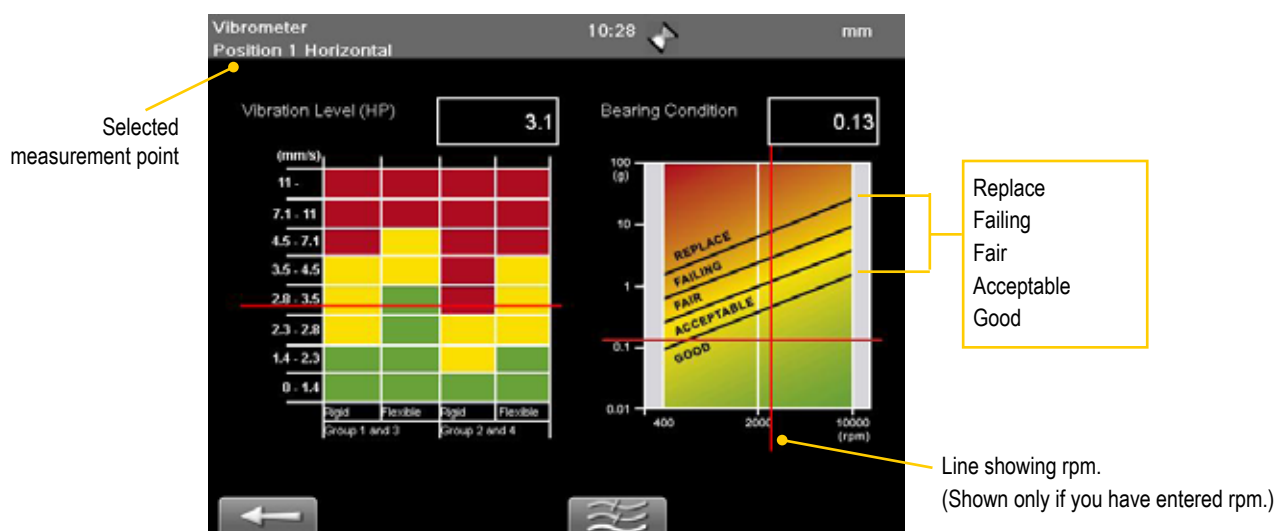
Bearing condition value is used for trend analysis. If the bearing condition value increases over time, it can be a sign of that the bearing is poorly lubricated, overloaded due to misalignment or has a damaged surface. A high bearing condition value can however appear in gearboxes, converting machines with cutters and similar machines without any bearing fault. This is because this type of machinery naturally produces high frequency vibrations that are similar to the vibrations produced by a machine with a bearing fault.

The bearing condition value is the quadratic mean, RMS value, of all high frequency vibrations between 3200 Hz to 20000 Hz. This value is an acceleration average measured in multiples of the standard gravity constant, g.

The diagram below is only a guide to interpret the bearing condition value. A high bearing condition value should always be used as a request to make detailed frequency analysis. Do not change bearings before this is done.

Open tolerance table for bearing condition

1. Select a measurement point.
2. Select  to open the tolerance table.



TECHNICAL DATA

System Easy-Laser® E530 Shaft, Part No. 12-0695



A complete system contains

1	Measuring unit M
1	Measuring unit S
1	Display unit
1	Barcode reader incl. stickers
2	Cables 2 m [78.7"]
2	Shaft brackets with chains
2	Extension chains
1	Set of rods 4x60 mm, 4x120 mm [4.72", 2.36"]
1	Measuring tape 3 m [9.8 ft]
1	USB cable
1	Charger (100–240 V AC)
1	CD with documentation
1	Carrying case

System

Relative humidity	10–95%
Weight (complete system)	7.3 kg [16 lbs]
Carrying case	WxHxD: 500x415x170 mm [19.7"x16.3"x6.7"]

Display unit

Part no. 12-0700

In the Display unit you are guided through the measurement procedure and can save and analyze the results.



- A Connection for charger
- B USB A
- C USB B
- D Easy-Laser® measurement equipment

Display unit	
Type of display/size	VGA 5.7" colour
Displayed resolution	0.001 mm / 0.05 thou
Internal battery (stationary)	Li Ion
Operating time	Appro. 30 hours (Normal operating cycle)
Connections	USB A, USB B, Easy-Laser® units
Storage memory	>100,000 measurements
Help functions	Calculator, Converter
Environmental protection	IP Class 65
Housing material	PC/ABS + TPE
Dimensions	WxHxD: 250x175x63 mm [9.8x6.9x2.5"]
Weight	1020 g [2.3 lbs]
Cables	
Type	With Push/Pull connectors
System cable	Length 2 m [78.7"]
USB cable	Length 1.8 m [70.8"]
EasyLink™ data base software for PC	
Minimum requirements	Windows® 95 or later 256 Mb RAM, 5 Mb free hard drive space

Measuring units

Part no. 12-0697

Part no. 12-0698

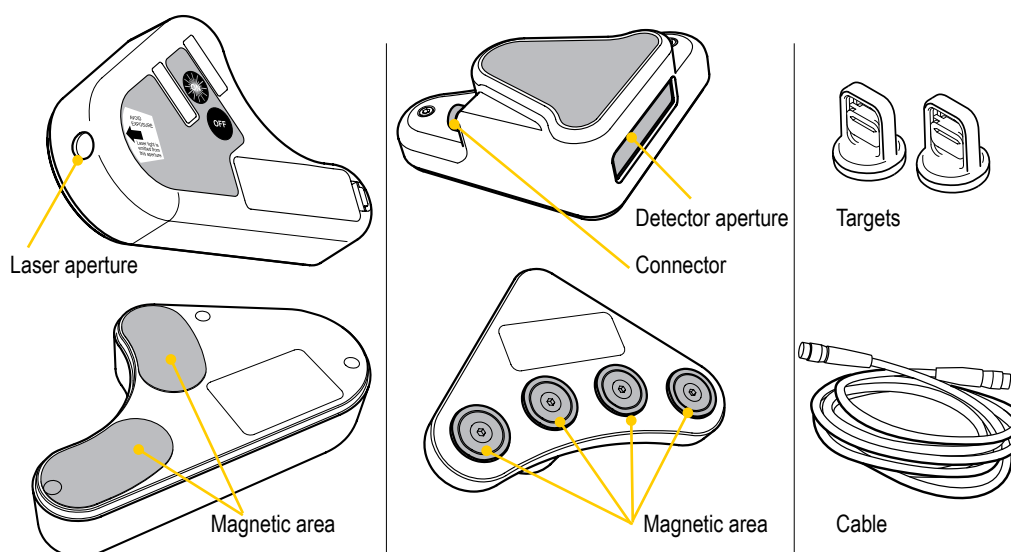


Measuring units	
Type of display/size	PSD 30 mm [1.18"]
Detector resolution	0.001 mm / 0.05 mils
Measuring errors	±1% +1 digit
Measurement range	Up to 10 m (33 feet)
Type of laser	Diode laser
Laser wavelength	635–670 nm
Laser safety class	Class 2
Laser output power	<1 mW
Inclinometers	0.1° resolution
Thermal sensors	- 20–60 °C
Environmental protection	IP Class 65
Temperature range	-10–50 °C
Housing material	Anodized aluminium / ABS plastics
Dimensions	BxHxD: 60x67x42 mm [2.36x2.63x1.65"]
Weight	164 g [5.8 oz]

BTA E170 (Optional)

Part no. 12-0659

Clean the units and the windows at the apertures with a dry cotton cloth. If not using the system for a long period of time, remove the batteries.



Laser transmitter	
Sheave diameter	> Ø 60 mm [2.5"]
Laser class	2
Output power	<1 mW
Laser wavelength	635–670 nm
Beam angle	60°
Accuracy	Parallelity: < 0.05°, Offset < 0.2 mm [0.008"]
Battery type	1xR6 (AA) 1.5 V
Battery operation	8 hours cont.
Material	ABS plastics / Hard anodized aluminium
Dimensions BxHxD	145x86x30 mm [5.7x3.4x1.2"]
Weight	270 g [9.52 oz]
Detector unit	
Displayed resolution	(Changeable between mm/inch) Axial offset: 0.1 mm [0.005"] Angular value: 0.1°
Measurement distance	Up to 3 m [9.8'] between transmitter and detector
Measurement range	Axial offset: ±3 mm [0.12"] Angular value: ±8°
Housing material	ABS plastics
Dimensions BxHxD	95x95x36 mm [3.7x3.7x1.4"]
Weight	170 g [5.99 oz]

Vibrometer (Optional)

Part no. 12-0654



Instrument/Software	
Measurement range	0–50 mm/s [0–2 inch/s] RMS
Resolution	0.1 mm/s [0.005 inch/s]
Frequency range	Total level: 2–3200 Hz (Lp), 10–3200 Hz (Hp) Bearing condition: 3200–20000 Hz
Probe	
Sensitivity	100 mV/g $\pm 10\%$
Dimensions	Magnet: L=20 mm [4/5"], \varnothing =15 mm [19/32"] Gauge tip: L=65 mm [2 1/2"9]

ADDITIONAL EQUIPMENT

Battery pack with Bluetooth®

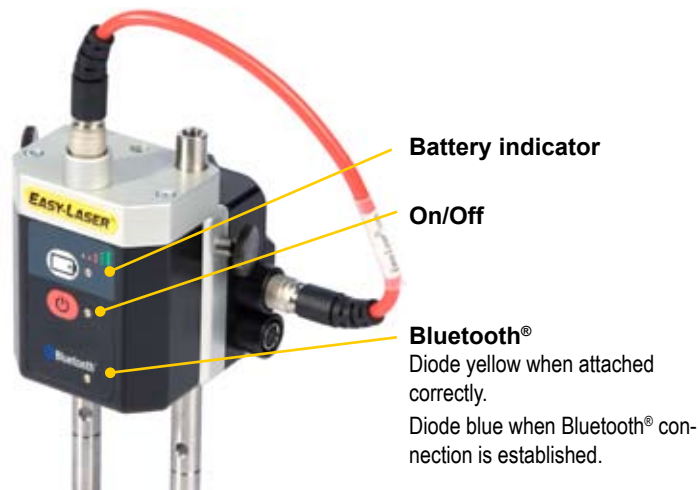
(Part No. 12-0618)

Optional equipment

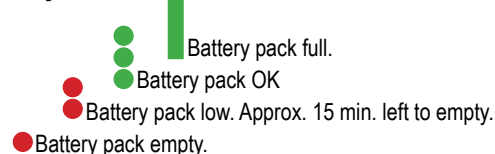
The ELM and ELS detectors does not have a built-in battery. You need to connect them to the Display unit via cable or use our chargeable battery pack.

The Battery pack has Bluetooth® functionality. For more information on how to set up and search for Bluetooth® units, *see chapter Control panel > Bluetooth*. The Battery pack's serial number is placed on the back-side. This serial number is shown in the Bluetooth view in the Display unit.

When the Battery pack run empty, the lights for Battery indicator and On/Off are switched off.



Battery indicator

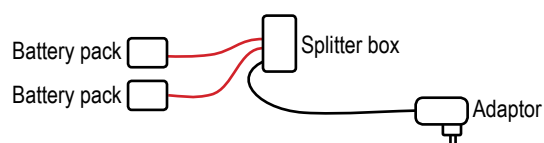


Charge battery pack

Use our splitter box to charge the battery pack. (Part No. 12-0597).

1. Plug in the power adaptor to the splitter box. Use the standard power adaptor delivered with your system. All lights are lit up on the splitter box.
2. Plug in the battery pack(s) to the splitter box. Corresponding light is switched **off**.
3. When the battery pack is fully charged, the light is switched **on** again.

Charge batterypacks



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